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GAS LIGHT JOURNAL
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DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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[OFFICIAL NOTICE.]

Southwestern Gas Association.

OFFICE OF SECRETARY, GALVESTON, TEXAS, Feb. 24, 1890.

The annual meeting of the Southwestern Gas Association will be held in Dallas, Texas, March 12 and 13, 1890. The arrangements for the meeting are now being perfected. Headquarters will be at the Windsor Hotel.

C. P. RUSSELL, Sec'y.

[OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF SECRETARY,
COLUMBUS, O., February 22, 1890.

To Members of the Ohio Gas Light Association:

Gentlemen—As previously announced, the Sixth Annual Meeting of this Association will be held at Toledo, O., beginning at 10 A.M., March 19, 1890, and continuing two days. Boody House will be the headquarters of the meeting, the various sessions of which will be held in a very suitable room in the same hotel. Members and others desiring to attend are advised to write well in advance for rooms.

The following papers have been promised for the meeting:

1. "Theory and Practice in Gas Management," J. M. Bate, Supt. Gas and Coke Company, Canton, O.
2. "Municipal Control of Lighting," H. Wilkiemeyer, Supt. Gas Light and Coke Company, Portsmouth, O.
3. "Combination of Gas and Electric Lighting in a Small Town," George W. Bowers, Sec. Gas and Electric Light Company, Hillsboro, Ohio.
4. "Our New Coal Gas Works," G. A. Hyde, Engineer Gas Light and Coke Company, Cleveland, O.
5. "Advantages of a Combined Coal and Water Gas Plant," Geo. Light, Asst. Supt. Gas Light and Coke Company, Dayton, O.
6. "Another Year with Fuel Gas," Chas. H. Evans, Manager National Gas Company, Jackson, Mich.
7. "Ohio Street Lighting Statistics," W. C. Hedges, Secretary Gas Light Company, Mansfield, O.
8. "Graduated *versus* Uniform Rates," Chas. R. Faben, Jr., Supt. Gas Light and Coke Company, Toledo, O.

The following questions have been proposed for the "Question Box:"

1. At what point in the works is the best place for the exhauster?
2. In a lighting territory covered by illuminating gas and the incandescent electric light, which seems to be in the ascendency?
3. Does a fine gas of 23 to 25-candle power help check the invasion of the incandescent electric light?
4. Should we not confine the work of our Association to the important interest it was established to promote, viz.: gas lighting and the [illegible] coal gas?
5. [illegible] stem of electric lighting is best for adoption by gas [illegible]
6. Are [illegible] pipes better and cheaper than wrought pipes for gas mains of 2 to 4 inches in diameter?
7. Does it pay to coat gas mains with coal tar?
8. What is the average life of a meter in constant use, with ordinary good care?
9. Is not illuminating gas of good candle power, sold at a reduced price for fuel, the true solution of the fuel gas problem?
10. Which is the correct method of tapping mains, on top or at the side?
11. Is the Welsbach burner with natural gas a success, and what proportion of the lighting does it do in towns having both natural and artificial gas?

Other interesting questions have been proposed, which will be presented at the meeting, and members are requested to come prepared to participate in the discussion of the above papers and questions.

Provision has been made for an exhibit, in connection with the meeting, of all kinds of gas appliances and apparatus, a large room on the ground floor, a few doors from the hotel, having been secured for this purpose. No charge for floor space will be made to exhibitors, and those desiring to avail themselves of this excellent opportunity of displaying their specialties will consign their goods and address their communications to Mr. Chas. R. Faben, Jr., Supt. Gas Light and Coke Company, Toledo, O., who has the matter in hand, and who will arrange the exhibit to the best advantage of all concerned.

In addition to this exhibit there will be other objects of much interest to our members and visitors, and the meeting promises to be in every way successful. It is hoped that every member will show his appreciation of what has been done, by being present; and gas companies not heretofore represented at our annual gatherings will be profited by sending a representative to this meeting.

A cordial invitation is constantly extended to all who may desire to become members of the Association, to do so, and the Secretary would be pleased to hear from any such persons.

IRVIN BUTTERWORTH, Sec'y.

BRIEFLY TOLD.

THE TOLEDO MEETING.—With the echoes of the New England meeting, and all its lessons of progress and union, still fresh in the senses of the fraternity, our thoughts and hopes are directed toward the annual gathering of the Ohio Association, soon to be held in Toledo, under the guidance of Mr. Lindsley, of Cleveland. The current number of the JOURNAL contains Secretary Butterworth's official outlining of what the members are to have placed before them. In the first place, the local committee have been eminently successful in their matter of a choice of a hotel—the Boody House—which is also to be availed of as a place for meeting. This assures goodly and regular attendance at the sessions, at least in so far as these things depend on any preparations in advance. Passing, but not lightly, from the Secretary's hint about the wisdom of writing well in advance for rooms, we are confronted with the paper list, which amply proves that the sixth annual meeting will not suffer from lack of presentation of topics at once timely and interesting. In connection with the list, we note that some of the papers ought to prove more than ordinarily attractive, since apart from the intrinsic merit of their matters, some of these cannot fail subsequently to be placed in direct comparison with those read on kindred subjects at the New England meeting. The "Question Box" initiation at the Ohio meetings will be most auspiciously inaugurated, since no less than 11 queries have already been committed to its custody. Some of them, too, are on the decidedly complex order, which, of course, will cause their unravelling to be all the more eagerly looked forward to. We would place especial stress upon the Secretary's invitation to the manufacturers of all sorts of gas appliances to send on lines of their goods for display at the proposed exhibition of such, in connection with the convention. The only expense they will be at will be in the forwarding of their exhibits, and the most conservative of the manufacturers must of necessity concede that the advertisement gained will more than repay them for any expenditure so incurred. Even with the hurriedly arranged exhibition at Mansfield, last year, a very creditable display was made, and the exhibitors have no reason to regret that they took part in the affair. A master hand—that of Mr. Chas. R. Faben, Jr.—is in charge of the Toledo exhibition, and it is due to him and the Association that their efforts be encouraged by a good display. That is the recompense which will best humor them. The outlook for a successful gathering is most promising.

IN BAD FAITH.—We are informed that the City Attorney, of Thomasville, Ga., at the request of the City Council, has delivered an opinion respecting the right of that community to grant exclusive privileges to a corporation for a term of years. He declares that a contract between any Georgia city and any corporate company under which exclusive privileges are granted the latter is not binding upon the city unless the city's charter specifically confers such powers. The construction of the law arose from a contest between the city of Thomasville and the proprietors of the Gas Company as to whether the exclusive portion of the Company's charter—to run for 25 years—was valid. When certain capitalists invested their money in a gas works for Thomasville the authorities promised them protection. Now that the money is invested, Thomasville turns them adrift. It is only the same old story—bad faith.

OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 248.]

TWENTIETH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB. 19 and 20, 1890.

FIRST DAY—FEB. 19—MORNING SESSION.

PRESIDENT'S ADDRESS.

President Taber then delivered the following address:

Gentlemen of the New England Association of Gas Engineers:—We meet again to-day as fellow soldiers may, conscious of a forgetfulness born of the very intensity of our absorption in our profession—almost as if the new rays of the incoming morning had greeted us unawares, so busy have we been in the attempt to meet the increased demand, both mental and physical, developed in the past year.

As a manifest of that activity I have counted the number of papers offered, their wide scope and practical bearing; in fact, the number here present is in itself an earnest that we have need of one another's goodwill and co-operation in the endeavor to do faithfully our "little daily work." For myself I have no word of apology. I did not deserve the honor at your hands; I shall do my best not to disgrace it.

But even now as we gather I listen in vain for the answer in the roll call to the name of one who always answered, and hear only in my memory the funereal tolling of that bell in the quiet graveyard, constantly reiterating in hushed tone the sense of loss we all felt in the death of our friend and associate, Oliver E. Cushing.

"Oh, thicker, deeper, darker growing,
The solemn vista of the tomb
Shall know henceforth another shadow
And give another cypress room—"

Who of us is ever prepared for the death of his friend? I could but think, as on that January day we stood beside the grave decked with evergreen under the drooping sky, the swiftly rushing waters mocked the preacher's words—for were they not rapidly passing away, too—dust to dust—pain and sorrow and loss.

We are not met to-day for sentiment, yet who does not feel that sense of loneliness which closed in as we drove through the ivy-covered gateway and left our friend forever. I want to bear witness to the warmheartedness, the cordial sympathy, the honest manliness of our associate. You will, I have no doubt, take later action in regard to his memory; but I wish right here to say that I took the liberty in your name to wire at the time my sense of the loss this Association feels as Engineers and men in his sudden death.

In common with the members of the National Association, we shall join in a similar tribute of respect to Mr. Forstall, of Chicago; but our loss in Mr. Cushing is peculiarly ours. No one among us will be more missed than he.

But, gentlemen, as I look over the interests of the gas companies today, I wish to premise my observations on a legal decision of Judge Story, who, in a certain case, defined the office and functions of a gas company as a public corporation, not in the sense of a municipal institution, but a quasi-public corporation, devised simply for the purpose of gain. Fortified, therefore, by such a weight of legal acumen, and removed from any stigma (since this is a judicial remark, not a forensic appeal), I presume we must all concur that as the official servants of these gain-seeking corporations we also have this aim in view, in gathering here year after year, viz., such comparison of ideas, plans and investigations as shall bring increased revenue to the corporations with which we are connected, increased light at lower rates to the public, and shall subserve their and our highest business interests. And I dwell somewhat strongly on this basic theory, so-to-speak, of our duties as an Association, since I am afraid that the ancient definition of our special duty as gas engineers may require a creed-changing committee to make it conform to the modified status of the business of furnishing such substitute for daylight as shall be pronounced by our customers every way satisfactory in convenience, everyday adaptability, and, above all, cheap.

I can fancy a club of gas engineers formed for the scientific part of the illuminating gas problem—the chemical section, so-to-speak, of our business. Such an one might spend the hour turning and overturning the theory of the illuminants, measuring their strength and the differentials of various gaseous compounds, perhaps even building up by synthetic processes a gas, innoxious, more luminous, with or without heating qualities, and capable of easy distribution—I sincerely hope also far less wasteful in destructive distillation. To such a body skilled mechanical

engineers might be added, who would construct the formula required for the best erections of plants and laying of mains, the best methods of furnace erection in regenerative benches, or plans of retort house or holder frames. Such a gathering might strictly be called an Association of Gas Engineers, the single aim being adhered to with more or less directness of purpose, of consulting together as to method of manufacture —the applied chemistry and engineering of our special hobby.

On the contrary, to-day I think the twentieth meeting of our Association convenes feeling more or less indistinctly the pressure of an impulse which warns us that the day must not be spent in scientific problems, or theoretical speculations on the manufacture of illuminating gas, important as we have always considered it. I do not allude, perhaps, to any anxiety arising from any existing competition of coal gas with electricity or water gas, as that indefinable sense of a public demand for something which necessitates greater care and thought as regards our relation to that demand. In fact, we to-day lay ourselves open to the criticism that we are no scientists at all, through the necessity of meeting the requirements of such a demand as I have mentioned, which, since the advent of electricity, has grown acquainted with its wants and recognizes any dilatoriness in the good will or ability of a gas company to meet it.

I am glad of the position taken by the Gas Commission, which has resulted in doing away with much of the mystery attending the cost of gas from the public mind, which exaggerated the unknown quantities, both depressing the cost and swelling the profit. This removed, the public has learned to expect better results; and I therefore feel an absolute indifference to any party criticism, whether your discussions shall relate to any topic relative to artificial light and heat, since for the purpose of gain we are gathered not as illuminating gas engineers, not as fuel gas engineers, not as electric engineers—because each of us is or should be all these, and because, by reason of this public demand, we are not so much interested specially in the method and economy of their manufacture as directly in the method and economy of their sale. Perhaps, also, it might be broadly stated that both parties—the manufacturer and the consumer—have found it their interest to investigate the need and requirements of each special light installation, and thus it comes to pass that of the 126 gas companies doing business in New England probably 25 make and sell water gas and 36 electricity, while nearly all are engaged in the sale and rental of gas stoves and, in a less degree, fittings and chandeliers.

To me it seems as if some recognition should be taken of this change of direction (which, after all, may be only temporary), that we may have some idea of what is involved. Is it necessary and profitable, or necessary and unprofitable? Could there not be a medium path pursued without this equipment of the stove manufacturer and the fixture manufacturer, and, more broadly still, the arc and incandescent light? Whence arises this necessity? I answer, What was the necessity for regenerative burners, Lungren and Wenham, which were only partial efforts to perfect local illumination? The incandescent burner, water gas (itself a gas of 20 and odd candles), arc lamps, incandescent electric lamps—what are these but the answer to a call for something, more or less indistinct in the call, and more or less indistinct in application to the needs of a public which required something for usefulness or luxury which it did not possess?

"Blind mouths," we call them. Aye, but not to remain so; and because municipal opposition answers every attempt at anything over competitive prices, the franchise so valuable to any illuminating company of the good will of the community must be gained by reasonable rates and efficient service. Under this pressure many of the petty items of management—meter rents, cost of service and connection, interest on mains, small repairs, burners and tips—these minor sources of aggravations, must be more or less done away with. Skilled workmen must be employed to advise and assist in installation of stoves and gas fixtures and systems of piping. It is noticeable that in France the Paris Gas Company is even desirous of illustrating the advantages of gas as a source of ventilation, a point which I hope our architects also will take up. And like the shopkeeper we must subdivide our wares, because the public will have it so, and vend and sell as best we may—regenerative burners from our illuminating gas department, heating stoves and ranges from our fuel gas department, and electroliers and lamps from our electric department; and, therefore, many of us have come here to-day with this conviction, perhaps better felt than defined, that, to maintain a footing in our communities, care must be taken to make what the people want, as they want it, and learn how to skilfully sell it.

I have added advisedly the words "electric department" to the requirements of a gas company, although I am well aware all do not so consider it. All are agreed on the gas and stove departments, but the competition of arc and incandescent lamps, irrespective of the corporate ownership behind them, is developing their use in places hitherto supposed impregnable. I shall perhaps be able to allude to this later; it is enough just now for my purpose to emphasize the business habits of the purveyors of electricity, their methods, often very faulty, but always telling in the matter of contracts and choice of customers. Some of their habits, which remind me of those old days when we heard the word pirate uttered savagely enough in these rooms, are not to be considered, perhaps, models; but surely among the new duties which 1889 gave to 1890, I place most prominently the necessity of care and skill in meeting the particular need of each of our consumers.

Connected with this subject, and necessitated by the same clamor of popular pressure, I would call your attention to the necessity of the Association as a body maintaining greater unity if possible in its attitude toward competition and general municipal legislation. There is nothing which has given the representatives of gas companies more respect and power than such an Association of intelligent men who could without any jealousy of interest freely compare notes and expressions and maintain a solid front against opposition. I recognize also the delicacy of any attitude which might be misunderstood to mean any combination against the actions of a legislative body from whom we have derived our charters; but I think this Association has a duty to itself in watching the course of private legislation and furnishing reliable information about matters connected with the gas interests.

The Massachusetts Legislature has bills before it now to repeal the 10 per cent. carbonic oxide law and the establishment of the office of gas commissioners, bills regarding the municipal purchase of works, gas and electric, the overhead wire system—a perfect Pandora's box filled for the nonce with panaceas and blessings. I know I voice the mind of this Association when I say that in the matter of the gas commissioners the repeal of the bill creating their office would be an injury to the best interests alike of the consumers and the gas companies. And I think some expression of this kind is due them from us; for if we have not wholly sympathized with them in all their decisions, no one certainly has ever failed to recognize the justice, legal fairness and courtesy with which these decisions were accompanied; and I would recommend that a suitable committee be appointed by this body, to have the care of this subject of municipal legislation in the different States represented here, and render such aid as may be required, drawing upon our Treasurer, not to exceed a given limit, for the necessary expense.

And now, as I survey the actual work done in 1889, what is the result of the review? The forthcoming report of the gas commissioners will tell of a prosperous year, of good dividends and fair prices. Mr. Hinman reports fair averages of candle power. No one, so far as I know, has reached the dollar limit; no one makes fuel gas; no new improvements of any importance in manufacture have been introduced, except in the substitution of Lima oil for cannel, and home-made iron sponge for lime. As I have before said, the attention of the gas engineer has not been called this way. I had hoped some results might have been reached from the system of inclined retorts, and yet more from the combined firings of Mr. Clark, which I must confess interested me greatly as a move in the right direction. When it is considered that 28 per cent. of the cost of the gas in the holder in America is represented by less than 10 per cent. abroad, it certainly is necessary not to cut down the daily price of labor, but to increase its efficiency by competent apparatus.

Of course, the two great movements of the year have been in the departments of water gas and electricity. Experience has finally solved the question of fuel gas to a question of appliances, and has confined it to my mind somewhat strangely to the development of gas ranges, the number of which has argued barometrically as it were to the activity or heaviness of the atmosphere of the gas company's office. I much regret that the exhibition which it was hoped might be made of heaters and ranges, and which was entered into so heartily by the leading manufacturers, had to be given up for this year at least. It would, I think, have been of interest to watch the development of the heater; for instance, from the plain reflecting stove through what might be called the regenerative plan of the Fuel Gas and Engineering Company to the steam heaters of the Backus type, and the furnace of Mr. Hawley. Here again the idea of locality and appropriateness of use suggests opportunity for each type, and I think the public demand a proper one for a good fuel at a reasonable rate. We need not be frightened at Mr. Young's figures. There will be plenty of time for the extension of our works before fuel gas is a success on such an extended scale as to require millions of capital; but I am heartily glad if the Michigan plan has earned its dividend, that it has dared to try the experiment at 30 cents per 1,000.

In water gas, however, much capital has been invested, mainly as

an auxiliary to coal gas plants, to obtain higher candle power and for prudential reasons. Many things have drawn attention to this subject, such as the visit of eminent gas engineers from England, the great strikes in the works at London, Birmingham and elsewhere, the cheapness of Lima crude oil, and the necessity of increased holder capacity. We have two papers on this subject, and I forbear to take your time.

I have already alluded to my own attitude regarding the electric department. My experience has been such that I could draw no other conclusion. Let me state the facts. For the two years 1886-87, the Gas Company in New Bedford was in opposition to two electric companies, one arc, the other incandescent, and barely held its own. Gas stoves, Lungren lamps a perfect sales department of fittings and fixtures, were no obstacles, and lower prices only resulted in decreased revenue. By the purchase of one plant and the development of a Westinghouse apparatus, the Company in 22 months added 4,500 incandescent lights and 400 arc lights, equal perhaps to 100 per cent. of the revenue and 150 per cent. of the total gas sale, if converted into gas figures. Could this have been done any other way? And yet more; for by the purchase of the Edison plant, now about consummated, a community of 37,000 has found a place for nearly 13,000 incandescents, 550 arcs, with gas sales of 42 millions. And I instance these figures not to boast how mushroom-like this demand has been as to call attention to the demand itself—its quality, its certainty, and the necessity of meeting it. Such questions as, "Could not this all have been done by gas," and "Would not the same capital have paid better?" resolve themselves into the habit of the public, their cultivation and needs. This abnormal demand for incandescent light argues two ways—either poor gas and poor methods of distributing it, poor general management, from the imputation of which we are relieved since we could sell electricity, or it argues a popular demand which will take nothing else. And, therefore, I think an electric department is justified, sometimes at least, and the whole argument resolves itself into some such ledger entry as this:

Dr. The most successful development of gas likely to be compromised by the attention paid to electricity; the excessive cost of capitalization, contract system, uncertain report and depreciation account; the novelty and possible short life of patents and consequent cheapness of inventions and capitalized plant; the unreliability of storage batteries; the danger to life and capital. While to its credit must be placed whatever intrinsic merits electricity may possess as a dividend winner, its own necessity, and the benefits of its control.

The year 1889 has diminished to some extent the debtor side, in furnishing some more reliable data on which to base the capitalization, the repair and depreciation, and danger accounts. Capitalization has averaged $250 to each horse power, with the best of engines and dynamos; repairs and depreciation are placed within 5 per cent. of the investment; meters and contracts are not so much guess work as formerly, and the cost of electricity has proved not so widely variable in different conditions, or in fact so far different from the cost of gas as many have supposed. But I firmly believe that an opposition controlled by your self is a safe one, and there can be no incandescent lamp installed, except in a few isolated cases, which is not a menace or a substitute, actual or possible, of a gas jet; and the development of either high tension or continuous incandescent systems means the gradual extinction, not of the gas company, but of its immediate profits on any line of main in spite of the tendency and advantage of increased demand for light wherever the gas burner remains. In the race for future development I think both systems are equally matched. What regenerator benches will do, compound condensing engines will do, and though I do not expect we shall ever make gas by electricity at the rate of 17 cents per 1,000, this is as good an instance as any of the million possibilities which the gas engineer expects when he adds the electric department to his already overloaded brain. Mr. Fowler will call your attention more closely than I do to the necessities and economics of the subject. For myself, I have looked upon it somewhat as an insurance of the gas interest, until the *bona fide* legitimate business and popular demand convinced me of its intrinsic merits. I have been amused that the petroleum industry got hit by it as well as the gas. I shall certainly expect that neither prejudice nor unreasoning opposition will hinder a free discussion of the subject.

And now, gentlemen, I ask your attention to the papers which are to be presented by those whose names will give weight to their words. I would ask of each of you to take such advantage of the privileges of the Association that, recognizing some superiority in another's methods or work, you may feel free to ask and the right to expect an answer.

We shall all recognize, I have no doubt, the shadow under which we have met. We all know that each year to us also the horizon of our purpose opens wider over the untracked seas. I repeat it is our duty to make ourselves acquainted with every revelation of light which can benefit mankind and by any system of municipal distribution. But as I look out over the blue waves so entrancing in the bright sunlight, I know also the possibilities of disaster and defeat and the necessity of conservative management and expense. On the one hand, lie the restriction of sales to new districts, new purposes; on the other the interminable vexations of patents, and the character of the business itself. In front of us our legitimate object this "gain," bringing with it the indorsement and good will of the community. As Matthew Arnold said of History, "The treasures indeed are ample, and we may reasonably fear whether we shall have strength and skill to own them."

Committee on President's Address.

Mr. Stiness—There is at least one subject in that address which should be referred to a committee for consideration; hence I move that the President's address be referred to a committee to be named by the Secretary, with instructions to report at this meeting. I ask that I may be omitted from the committee.

The motion prevailed, and the Secretary named as the committee Messrs. F. S. Richardson, C. D. Lamson, and H. B. Leach.

Treasurer's Report.

The following report from the Treasurer was read, and, on motion of Mr. Stiness, it was received and placed on file:

Charles H. Nettleton, Treasurer, in account with the New England Association of Gas Engineers.

Receipts.

1889.	Balance		$92 77
	Received dues, 1888	$9 00	
	" " 1889	99 00	
	" " 1890	273 00	
			381 00
	Admission fees, meeting 1889		115 00
	Interest, Derby Savings Bank		30 37
	Dinner tickets sold, meeting 1889		180 00
			$799 14

Expenditures.

	Expense of meeting, February, 1889—		
1889.	J. R. Whipple	$323 10	
	Z. M. Jenks	2 25	
	D. H. Bacon & Co	48 55	
	Dr. Lewis M. Norton	50 00	
	T. S. Bassett	22 00	
	J. R. Whipple	15 00	
	D. H. Bacon & Co	11 50	
	Derby Gas Co	15 51	
			$487 91
	Chas. H. Nettleton, salary		200 00
	Balance		111 23
			$799 14
	Permanent fund deposited in the Derby Savings Bank		$600 00

Amendment to Constitution.

The President—You will remember that in the call for this meeting an amendment to the Constitution was referred to as having been accepted and approved by the Directors, and recommended by them to this meeting for adoption. The amendment is to Article IV., which now reads:

4. Any New England Gas Engineer may become an active member upon application to the Secretary, accompanied by the endorsement of two active members of the Association, and the membership fee of five dollars, the approval of the Board of Directors, and an election by three-quarters of the votes at any regular meeting of the Association, and by signing an agreement to pay such assessments as may be levied by the Board of Directors. Any Gas Engineer residing out of the New England States may be elected an honorary member by the same vote as is required for the regular election of members of the Association. Any person residing in New England, and connected with industries pertaining to the gas business, may become an associate member upon conditions prescribed for active members. None but active members shall vote or be eligible to office.

It is now proposed to omit the words "residing out of the New England States," in the seventh line. What action will the Association take upon the amendment?

On motion of Mr. Harbison, the amendment was adopted.

COMMITTEE ON NOMINATION OF OFFICERS.

The President—The next business in order is the appointment of a committee to nominate officers for the ensuing year. I wish to say right here that I deem Mr. Norton's action last year sufficiently valid to become the unwritten constitution of this body. He declined a re-election, and I think we had best adopt that plan in all our future work—unless we happen to get an extremely good President, and then we may re-elect him. As I look upon the matter, there are so many of you who are so much better than anybody else to become President of the Association that I think a change each year is the better plan. Therefore, I would like the nominating committee to consider that the President is not eligible to re-election, and I would like that to be the unwritten constitution of our body. Therefore, if it is your pleasure, the Secretary will take the names of a nominating committee, or the President will appoint one, if you so desire.

Mr. Stiness moved that the President appoint a nominating committee. The motion prevailed, and the President appointed as such committee: F. C. Sherman, A. K. Quinn and W. A. Learned.

MEMORIAL COMMITTEE.

Mr. Stiness—I move a committee be appointed to prepare a suitable minute to be spread upon our records with reference to the death of our brother, Oliver Edwards Cushing, and, as we have not the data at hand which would enable them to make a report at this meeting, that they be given authority to report in writing hereafter. I listened, Mr. President, with much interest to your remarks with regard to the death of Mr. Cushing; and, standing as we do to-day with the flowers hardly withered upon his grave, it is eminently fitting we should pause for one moment in the whirl of business to lay upon his fresh grave those flowers of memory, fragrant as they are to-day; and that we should recall him as one whom we have known for so many years as kind and gentle and a perfect man. I was pleased last night as I stood within these walls, and as many men came and gazed upon the counterfeit presentment of Oliver Edwards Cushing, to listen to the kindly feelings that they all expressed; and it brought back to my mind those words, perhaps familiar to you all, "It is pleasant to live in the memory of those we love, for that is not to die." This world is brighter and fairer because Oliver Edwards Cushing lived. I hope that the committee will be given authority, if not able to report to-day, to report in print, and that a copy of their report, suitably inscribed by our Secretary, be sent to the family.

The President—You have heard the remarks of Mr. Stiness, and I know that his motion has your approval, and that we do not need to take a vote upon the subject. I will appoint on that Committee Messrs. Stiness, Slater and Prichard.

READING THE INVITATIONS.

The Secretary read the following invitations to this meeting of the Association:

WALTHAM, MASS., Feb. 5, 1890.

MR. C. H. NETTLETON, Secretary:

Dear Sir—I wish to extend an invitation to the Association to visit the Loomis fuel gas plant in operation here at the works of the American Waltham Watch Company, at the time of the annual meeting this month. * * * * *

Yours very truly,
(Signed) WILLIAM TARBELL.

BOSTON, MASS., Feb. 17, 1890.

ROBERT B. TABER, ESQ., President N. E. A. of G. E.:

Dear Sir—The Boston Electric Club would be pleased to have the New England Association of Gas Engineers accept the privileges of the Club during the session of the Twentieth Annual Meeting of the Association, and extends a cordial invitation to members to visit the Club rooms, where they will be heartily welcomed. Very truly yours,

(Signed) HENRY B. CRAM, Prest.

Mr. W. A. Wood—I wish to say that the President of the Boston Gas Company, Mr. J. Edward Addicks, has extended a formal invitation to the Association to visit both the Bay State and the Commercial Point stations of the Company. It is proposed that at the close of the meeting on Thursday morning, which it is suggested shall not be later than 12 o'clock, the members shall take carriages and go from here to the Bay State works, where lunch will be provided, and that they afterwards visit the Commercial Point station. It will be necessary for some arrangements to be made, and we would, therefore, like to know how many will probably go. The idea is to get back in time to enable members who wish to do so to take the afternoon trains out of town.

The President—The three invitations are before us. What action will you take with respect to them?

Mr. Stiness—I move that the invitation of the Boston Electric Club be accepted. Being myself a member of that Club, I can assure the gentlemen present they will there receive a most cordial greeting from the electrical fraternity of New England. They have a very fine club room, and it is fitting that very close and fraternal feeling should exist between the two advocates of artificial illumination. I also move that the invitation from Waltham be accepted, with thanks. I suppose it would be almost impossible for all of us to visit Waltham, as the programme says that we are to visit the Bay State gas works. I move that that invitation be also accepted, and I feel that all who can visit the works will be well repaid for doing so.

Mr. Greenough—In regard to the visit to the Boston gas works, arrangements are practically as stated by Mr. Wood, that is, we should get away from here to-morrow by 12 o'clock, as we ought to get down to the Bay State works before 1 o'clock. We can get lunch there, visit the works, leave there at half past 2, get to the Commercial Point works at 3 o'clock, get away from there by 4 o'clock; and those who wish will be able to leave town by half past 4. I think any one can be sure of getting out of town by the 5 o'clock trains to-morrow afternoon.

The President—With regard to the invitation from the Electric Club, Mr. Stiness has moved that it be accepted, with thanks. [Adopted.]

The President—I confess the invitation to Waltham gave me great pleasure, but as we have already announced that we are going to visit the Boston works, it was thought best by the Directors that those who would like to go there and remain over on Friday, could visit Waltham. I am sure all who do go will be most heartily welcome. Mr. Stiness' motion is that the invitation be accepted with thanks; and while we cannot as an Association visit Waltham, that as many of our members as feel inclined to make the visit will do so, and that we acquaint Mr. Tarbell with the fact of our acceptance. [Adopted.]

The President—In the matter of the Boston Company's invitation, I certainly feel that we owe them many thanks for their kindness in the matter. It is desirable that as many as possible of the members shall accept the invitation, and that they be notified how many are likely to visit the works. I believe that all the business which we can attend to this morning is now completed, and we will listen to the reading of the papers. I will begin by asking Dr. Amory, of Brookline, Mass., to read his paper on the

MUNICIPAL CONTROL OF GAS AND ELECTRIC LIGHTING.

At the time I was invited by your Directors to write a paper on "The Municipal Control of Gas and Electric Lighting," we had just been through an experience in Boston which so illustrated the subject proposed, that my attention was very naturally attracted by certain phases of the question which have prompted the spirit of this address. I need not say that public discussion of the municipal control of gas manufacture is no new feature, and that many arguments for and against this control have been worn threadbare.

A few years ago I happened to be in the chemical laboratory, at Dresden, of a Professor of the Saxon University, when he was showing me the experimental results of some of his professional researches. It was in the twilight of evening, and being somewhat dark he lighted the gas jet. The illumination was so dim that he apologized for the poor light, and remarked that the city gas works were under the management of the municipal government, and, in consequence, the gas was of a very low candle power, besides being quite impure. I asked him if it was not cheap in price, and though I have forgotten what was the price he named, I remember being astonished at the high rate. I was then living at the best hotel in the city, and was obliged to dress and undress in my room after sundown by the light of an ordinary candle, because gas light was too costly for my landlord or his ordinary guests. I noticed also that the few apartments I visited in that city were lighted, except in the dining rooms and halls, by lamps or candles, in spite of the fact that Dresden is the capitol and court city of the kingdom of Saxony.

I had the same experience at Munich, and not at the time having any intention of managing a gas company, or its works, the affair passed out of my mind as one of the curiosities of German barbarity or poverty; nor did I, as I now regret, investigate further into the matter.

In our own country, the well known financial history of the Philadelphia gas works, managed by trustees appointed by the municipal government, is a curiosity of modern times.

This winter on the expiration of a three year's contract for lighting the streets of Boston by electric lights, the electric lighting companies, as my friend Mr. Neal, of the Charlestown Gas Company will bear me out, were confronted, at a conference with the Mayor of Boston, by the statement that if we would not agree to furnish light at 40 cents a night

for each street light, he would feel obliged to urge upon the city government the necessity of owning its own plant, so that the city might light its own streets.

Up to the present period, gas and electric lighting companies have been guarding only against the competition of their rivals, or the formation of new companies in their locality. They have even gone so far as to urge the parental arm of the State government to ensure to existing companies a monopoly of gas and electric light distribution. In our own State we are supposed to be protected by a Gas Commission, whose judicial and executive authority seeks to limit the sale of gas to companies already in existence, and the Commissioners apparently aim to settle differences between manufacturer and consumer upon an equitable basis of arbitration, rather than to discipline them by allowing the usual commercial custom of competition from companies additionally licensed to do business in the same territory.

That Board in its official reports, points to the fact that competition between rival companies invariably results in consolidation under larger capital investment, and so requires unnecessarily large dividends, which the communities should not be called upon to pay.

At the present time competition of private capital against private capital, previously invested, is not naturally a great cause for anxiety, because history shows that it will generally result in mutual compromise with fair dividends upon all moneys invested; if not by compromise, then by consolidation on a basis of larger capital, thus insuring the payment of omitted dividends which had been suspended during the sharp crisis of competition in previous years.

The *present* outcry is to save this payment of profit to private capital invested in gas undertakings by means of the municipal ownership and management of new plants built upon more modern processes of gas manufacture; and hence, supposed economy in cost of manufacture.

My purpose is to show the fallacy of this popular outcry, for I doubt if we appreciate how strong this demand is growing; and yet we know that the result of acquiescence and submission to this sensational effort will be as in private competition a duplication of invested capital to supply consumers within the same geographical limits. We all must recognize the fact that the same axiom prevails in our business as in other mercantile undertakings. The man or company that can make the largest sales of daily commodities can afford to do this at a smaller margin of profit than his competitor who makes small sales at larger profit. Long bills of sales and small profits will result in turning over invested capital more frequently every year; for instance, one cent made out of a dollar used ten times a year makes 10 per cent. profit during the year. We see an exemplification of this in the larger dry goods and grocery stores in our more populous towns. These do so much more business on capital invested that the small shops disappear very rapidly, and the large shops grow annually larger. Apply this principle to a city which lights its own streets from municipal gas works and consequently makes small sales at less profit. The same main which carries the gas of the private corporation to the shops and houses of its people could just as well supply gas to the street lights, and the private corporation can afford to do this at less cost on account of the larger amount of gas manufactured.

If a municipal government lights its own streets there is no inducement to its managers to increase the annual product of gas; and, therefore, having but a limited amount of gas to make, the expense for the long lines of mains will naturally increase the cost of manufacture. If the town of Brookline should lay independent gas mains for its own street lighting the cost would not be far from $75,000, or an annual interest account at 8 per cent. of $6,000; now, as this town used, in 1886, before electric lighting was introduced, 12 million feet of gas, this interest charge for mains would add 50 cents per 1,000 feet to the cost of gas, which otherwise could not be manufactured at so low a cost as compared with companies making a large product.

The North Attleboro Gas Company made for that year about 12 million feet of gas, distributed through less than 9 miles, and was obliged to charge $2.63 per 1,000. The profit paid in dividend by that Company for that year was only $800 over the interest which we have assumed as a proper charge for the town of Brookline to pay annually for its mains if used only for street lighting. It seems almost unnecessary to call your attention to the fact that if a town made its own gas every abutter would think he had the right to demand a street light in front of his own door.

During the year 1888 the Brookline Gas Company sold one-quarter of its gas for public street lights. The mileage of mains in Brookline gas territory was, for that year, 52; Boston, 129; Dorchester, 49; and Jamaica Plain, 26. Parallel pipes for these districts would double the capital required, and the cost of these mains in Brookline now amounts to nearly one-third of its capital used for the manufacture of gas; and in Jamaica Plain to even a larger proportion.

It is quite true that in Boston the percentage which the sales of gas used for street lighting bear to its total sales is a comparatively small portion of its revenue; but there is the stronger reason for the non-investment in a duplication of its pipe mains. The interest on cost of these mains is a very light burden for the Boston Gas Company, as it bears an annual charge of 5 per cent. against 95 per cent. In the more sparsely settled suburbs of that city the receipts for public lighting help to reduce the cost of gas to the house owner.

In order to reduce the cost of distribution the management of a gas company should be zealous in promoting sales of gas in its local territory; therefore, sales should be made to municipal governments for street lighting at such a low price, within the bounds of reason, that a liberal distribution of street lamps should be provided by that government. This will help to pay an interest upon the money required to lay mains through the streets, and as no meters are needed to register the amount of gas consumed, the price of gas for public street service can be for a less sum per thousand than that sold to private consumers.

Allow me just here to protest against the public outcry that private corporations occupy the streets without paying for their use. Common law requires that a personal tax shall be levied upon gas mains laid in the streets of a town or city. The Brookline Gas Company has to pay on her mains, within the limits of Boston, an annual rate upon a valuation of $35,000, amounting in the present year to a tax of nearly $26 per mile of main. It is an indirect assessment upon the licensee to use these streets.

It is not necessary to discuss the question of a town entering upon a commercial plan of selling gas to private consumers. The objections to this are as obvious as those against keeping public grocery stores, candy or peanut shops, and meat markets. Nor would it be fair to tax the poor man who now does not use gas in order to supply the rich man who will use gas, no matter what it may cost.

Another serious objection to a town lighting its streets by taxation for the expenses of running a gas plant, naturally occurs in a liability to suits from private individuals meeting with supposed accidents, owing to a negligent illumination of its highways, as well as from other supposed liabilities. Towns do not fare well in suits for damages brought by private individuals; they suffer in costs for actions of tort more severely than private corporations.

We all know, as gas managers, how dangerous are the temptations to spend money in improving our gas plants and electric light installations by listening to the importunities of those who have patent processes for the manufacture of gas or improved electric apparatus, at a cost of merely nothing.

We are all familiar with the common saying that the sale of residual products produces such fabulous prices that the sum received will pay the whole cost of coal, and perhaps a portion of the labor in making gas. Municipalities can borrow large sums of money by special legislation "outside the debt limit," and, consequently, having good credit, can spend money *ad libitum*, especially if managed by men who receive salaries rather than a dividend of profits upon their investment. Directors are mighty wary of increasing the company's debt, which will injure the borrowing credit or cause the stockholders to vote them out of office.

We see this remark exemplified by the large debts in our New England cities and towns for the improvement of their streets, schools, parks, sewers, and water supplies; and this danger has required the intervention of legislative action to limit the borrowing capacity of towns, based upon their assessed valuations. If now we add to the temptations of spending money the authority and power for towns to install gas and electric plants, the taxpayer's burdens will be unduly increased.

I have merely run over some of the arguments against a town establishing its own gas plant. Why, it may be asked, should not a town install an electric plant with which to light its streets, provided the people prefer this method of illumination to that of gas? My answer can be derived from the details of the Gas Commissioners' report for the year 1888.

About $5,000,000 of capital, bonds and liabilities, are invested in our State electric light companies. Their profits in 1888 from commercial and public lights together have realized about $220,000, or less than 4 per cent.; but in most instances the liabilities from unpaid bills are carried into the profit and loss account, and amount to nearly $108,000. If we deduct this from last year's income the profits are reduced to about $112,000 on an investment of nearly $5,000,000, or about 2 per cent., and if we exclude the two companies in Boston, this will leave the profit of that year's business for all the other companies in Massachusetts a sum

of $27,000 on an investment of more than $3,000,000, or less than 1 per cent. on investment.

Will any town with that showing care to go into the business of electric lighting for its own streets rather than hire the light from established companies? Is the business outlook promising? Are not the electric light companies undergoing the same discipline that our gas companies suffered from 30 years ago, when annual dividends to stockholders of gas companies were very small, and sometimes nothing.

There is one feature of the present day in reference to the subject before us that is only now beginning to form an important argument against municipal control of street lighting. I would have some hesitation in mentioning the argument before any but the audience now before me.

It is an open secret that to-day the profits from electric lighting are too small to induce any success in competition between companies exclusively engaged in this form of lighting; therefore, no municipality could reasonably expect to do a large amount of street electric lighting without combining with it gas lighting. You will see by the following extracts from the Directors' annual report to our Brookline Gas Light Company stockholders how, by a judicious combination of the two industries, a saving economy may be practiced:

"The sales of gas have increased so rapidly each year, that we shall soon outgrow our apparatus for gas manufacture and storage; in fact, this past season we have been obliged to use some of our reserve gas retort benches, on account of the large demand upon our resources. The full capacity of our retort house will yield us only 286,000 feet of gas a day, and during the long days at Christmastide we were obliged to manufacture a daily output of nearly 260,000 feet.

"We have only 8 benches. If we were lighting the same number of street lights as have been displaced by electric lights, we should be obliged to make 25,000 feet more per day for the long winter nights. If we should add to this daily requirement the gas needed for the private residences and public buildings now lighted by electricity, we should be obliged to increase our daily manufacture to 40,000 feet more than we are now making during the season when the nights are long. In other words, without our facilities of to-day for furnishing electric lights in addition to our gas sales, we should have been obliged to enlarge our retort house capacity by one-sixth. This would have required a new retort house to have been built more than 18 months ago, probably also an increase of our purifying capacity."

I ought here frankly to state that in gas companies which do also an electric lighting business, the general expenses, such as administration, rent, or interest on real estate, dividend of profits, general superintendence, taxes and other miscellaneous expenses are divided between the two investments concerned in gas and electric lighting.

Now what chance of competition can there be between a municipal gas and electric plant which furnishes only public lighting, and a private corporation which does or can furnish both public and private lighting by gas or electricity? Add to this the risks of suits for damages against infringements of patent devices used in electrical apparatus, and what city or town will care to assume this additional liability upon its taxpayers?

Municipal Electric Lighting.—What it cost Bangor to establish and maintain a plant.

Mayor Hart, on Jan. 20, received the following from the Mayor of Bangor:

"MAYOR'S OFFICE, BANGOR, ME., Jan. 18, 1890.

"Hon. Thomas N. Hart, Mayor of Boston—Dear Sir:—In reply to your request of Jan 8, will say: Our electric light plant, owned and operated by the city, is a success in every particular, and far exceeds the expectations of even the most sanguine. It consists of 165-light dynamo capacity, with 140 lights actually placed in the streets, all but seven being placed on mast arms; three circuits; total miles of wire, 36, run on poles; 2,000-candle power lamps; good quality of wire, well insulated. We have tried to have everything of good quality and work well done, and think we succeeded fairly well; and our total cost, including steam engine and boiler to be used in cases of emergency, has been about $33,000. (Original estimate, $27,000.)

"Our cost of operation, running all night every night, and making a liberal allowance for wear and tear, will not be far from $6,500 per year, or 13 cents per night per light (or $47.45 per light per year). This low cost is, of course, due to the fact that our plant is operated by water power owned by the city. We have steam auxiliary, however, and if operated by steam entirely our cost would not exceed 25 cents per night, and probably not be much over 20 cents. I believe any city situated as favorably for fuel as Boston can operate its own plant by steam for not exceeding 25 cents per night for 2,000-candle power arc lights, including all expenses for wear and tear; and prices heretofore charged by private companies for this service are outrageous.

"I know the arguments that are put forth in their interest and the means taken to influence and frighten the average citizen, and particularly the members of the city government, for I have just been through it all. If you are inclined to investigate this subject to any great extent, I would suggest a pamplet, Municipal Lighting, by Fred. H. Whipple, Mich., as likely to be of great help, and shall be pleased to give you such details of construction and operation of our plant as you may desire.

"Should have replied to your request earlier, but have been confined to the house by sickness for some time, and this is the first work I have done. Yours very respectfully, C. F. BRAGG, Mayor."

I must say that I am somewhat surprised at the contents of this letter, for the figures do not correspond with the experience we have had in Brookline, nor with those published by other companies in Massachusetts. Even suppose the city of Bangor has a water power which costs nothing, we cannot believe that its city government can buy good electric apparatus, or line wire, or poles or labor at any price less than some of the rest of us.

Let us analyze Mayor Bragg's figures by comparison with the usual commercial prices. I have seen some of the poles in Bangor, which are usually only 20 feet above ground; they would cost delivered about $3 each. Thirty-six miles of poles would require:

Cost of 1,080 poles, at $3, or	$3.240
Cost of setting 1,080 poles, at $2, or	2,160
Mast arms (133 in number) cost, at $18.50 each	2,460
Double circuit of water proof wire, and labor of stringing, including cross arms, etc., per mile, at $150	10,800
Average cost of 150 electric lamp capacity, at $75	11,250
Hoods and hanger boards, at $6 each	798
Cost of station (including building, switch-boards, wiring, etc.)	3,292*
	$33,000

Does this sum of $33,000 really include the whole cost? I do not think so.

Estimate cost of maintenance for all-night service, 150 arc lamps, 36 miles circuit:

Three trimmers, at $912 per year	$2,736	
Carbons, at $3.50 per night	1,277	
Dynamo man, at $3 per night	1,095	
Lines, repairing	912	
(No charge for oil and waste, and no charge for water power.)		
Charge for depreciation of plant, including repairs, 20 per cent.	6,600	
Interest on capital, at 6 per cent	1,980	
		$14,600
Cost of steam plant—		
Steam plant, 200 horse power, at $25 per H.P.	$5,000	
Steam pipe	500	
Heaters and smoke flue	1,000	
	$6,500	
Maintenance of steam plant—		
Depreciation, 15 per cent. on $6,500	$975	
Interest, 6 per cent.	390	
Fuel	5,000	
Oil and waste	600	
Engineer and stoker	1,300	
		8,265
		$22,865

I have not counted in the miscellaneous expenses, which may be judged from our own experience to be of no inconsiderable account in the bill for maintenance; as for instance—

Globes	$157 16
Repairs of lamps	125 76
Repairs of electric plant	440 00
Repairs of lines	1,625 00
Superintendence	500 00
Globes	102 12
Repairs of electric plant	2,593 37
Oil and waste	200 00
Average expense for two years	$5,743 41

* No estimate in detail could be made of this cost without inspection of the station, nor any allowance for auxiliary steam power referred to in letter.

The Mayor of Bangor may be a better manager than I am, but I do not see why our electric light companies in Massachusetts cannot produce a better result in their financial showing; for it does not seem to me that a plant of 150 arc lamps can be run at 13 cents a night without steam power, nor at 25 cents a night with the costs of the latter maintenance.

In Brookline we have about 36 miles of street arc lighting, and 129 lamps, and the expense costs us about 42½ cents. If we had 200 arc lights I estimate the actual cost for street lights about 33 cents per night. By the use of the Westinghouse alternating arc lamp system we are promised an annual saving in cost of maintenance for each lamp of $20, or 5½ cents per night, or a net cost of 37 cents per lamp per night; or for a 200-lamp outfit a further reduction of 7 cents per night.

In conclusion, I wish from these preceding views to sympathize this deduction. There seems to be in the minds of the public an opinion that illuminating companies are pirates that prey upon the purses of the community, endeavoring to take every advantage of a supposed monopoly to make an exorbitant rate of profit. Hence Gas Commissions and City Councils are invoked to interpose the right of eminent domain to compel gas and electric lighting companies to sell their products at an unremunerative price. We see this cloud, no bigger than a man's hand now, in many cities and towns in New England. It is especially a dominant impulse in the mind of Mayor Bragg, as shown by his letter.

I again repeat that we as gas managers must down this monster of public opinion by concessions, and must try our luck at economy of management to increase our prospects of small earnings. We must do this by offers to light public streets and buildings at the lowest possible cost, or else suffer the consequences. The lamentable exhibition in Boston of a disposition to crowd down the throats of the civic authorities a reasonably large price for street lights and for public buildings has resulted in a cat and dog fight which would be ridiculous if it were not dangerous to our existence. The older gas companies have profited by a long experience in meeting this issue. I sincerely hope that our younger brethren in the electric light business will copy our policy, and thus put an end to the popular demand for municipal gas and electric lighting.

Dunkirk, N. Y., 55-arc light plant.—Investment price, $13,338.71. Salaries of superintendent, engineers and firemen paid by Water Department.

One month's maintenance—

Superintendent's share of salary	$75 00
Engineer's salary	90 00
Firemen	60 00
Interest on plant, 1 per cent	134 00
Rent of station and land per month	100 00
Depreciation of plant, 1 per cent	134 00
Real cost of maintenance	$633 00
Cost of maintenance as reported	225 28
	$858 28

Average number of lights run during month, 55 arc lights. Total amount of coal consumed, 137,777 lbs., at $1.65 per ton, $113.55; number of carbons used, 3,412, at $11 per 1,000, $38.28.

6 gallons cylinder oil used, at 90 cents	$5 40
5 gallons lubricating oil, at 35 cents	1 75
6 globes used, at $1	6 00
10 carbon holders used, at 25 cents	2 50
6 brushes, at $1	6 00
20 lbs. waste, at 9 cents	1 80
Amount paid for labor	50 00
Total cost for October	$225 28
Total hours run	364¼
" cost of running 55 arc lights 364¼ hours	$225 28
" " " " " 1 hour	62
" " " 1 arc light 1 hour	01¼

Discussion.

The President—The subject of Dr. Amory's paper is now before the meeting for consideration. We would like to have a very free discussion by the Association with regard to the matter. I presume the subject is of most interest to us who live in Massachusetts, and I will ask Mr. Greenough to give us his opinion upon the subject, as relating to Boston or his own personal ideas of the same.

Mr. Greenough—The question of municipal lighting is a pretty wide one, and can hardly be touched on to the extent that I would like, in the few remarks that I shall have time to make here at the moment. I think that Dr. Amory's paper is an admirable one, but I think he touches perhaps too lightly upon the probabilities of cities and towns going into the business for the purpose of supplying private lighting. I have no idea for a moment that the city of Boston, for example, will ever touch the gas business in Boston, unless they propose not only to buy the street lights, but also to supply the private lighting, and thus have a hack at the profits which gas companies are supposed to be making. I think that the Gas Commissioners have proved a most valuable auxiliary to the gas companies. The idea which the public has had for many years of gas companies has been erroneous. There was a time 30 years ago (so my father has told me), when he was sent for by the Mayor of Boston and asked as to the profits of the gas business, and the Mayor gravely told him that he understood that they were sufficient, not only to pay the expenses and the interest on the cost of the plant, but were also sufficient to pay the whole expenses of the city of Boston. The treasurer of the Gas Company had no difficulty in showing the Mayor that the entire gross receipts of the Gas Company would not pay a tenth part of the expenses of the city of Boston at that time; and the Mayor found out that he was in error. When cities do go into the gas business, they will do so for the purpose of making money, and not alone for the purpose of supplying a good light to the public. What Dr. Amory has hinted at in his suggestion as to the mismanagement of the works in Philadelphia, and of the works in Dresden, requires more than a hint to be adequately expressed. I do not wish to be understood as saying that all municipal gas works are mismanaged. I have in my mind one or two municipal gas works in different parts of Europe, where I think the management is admirable; and the gentlemen in charge are honorable men and men of marked ability. But those instances are so much the exception, that the rule is anything but favorable to municipal control. We are continually being confronted, by the agitators of a species of socialism, with statements as to the number of municipal gas works which are being run in different parts of England, Scotland and Germany; but there are very few of them which, on a more extended examination of their figures and accounts, would not tend to discredit these statements, and to cast discredit upon the advantages which are claimed by the socialists. Moreover, there is a very great feeling, on the part of advocates of cheap gas, that the ordinary consumers do not get the benefit of the reductions in the cost of gas manufacture; but that the gas works are run more particularly for the benefit of non-residents tax payers, or fully as much so as they are run for the benefit of the consumers of gas. And, although you have pointed out to you with pride, when you go to Manchester, England, the magnificent City Hall which has been erected out of the profits of the gas works, yet, there is another side to that question; and the gas consumer has been forced in Manchester to see the price of gas put up much higher than has been done for the gas of similar grade supplied by private corporations elsewhere. These facts are undeniable. Looking upon the present situaiton in this country and upon the situation abroad, where there has been such a demand for relaxation to the laborer in respect to the hours of working, and where we see one gas company after another compelled to yield to the demand for only eight hours of work, thus being placed almost under the dominion of the labor unions, we are led to inquire what we will come to in this country, where universal suffrage is in vogue, and where it is impossible to avoid the conclusion that if the city works were run generally by the city managements, there would be a very large increase in the number of men employed, and a corresponding decrease in the number of hours which they work; and the result might be that the cost of gas would be so increased as to put gas in a very disadvantageous position when brought in competition with electricity. At best, gas has to struggle for its existence. The time has gone by, as I remarked some years ago, when we could fix our own price and collect our money; and the time has come when we have got to sell our gas at a price which will enable us to compete successfully with electricity and petroleum. If the city were running gas works can it be considered possible that the gas would be manufactured as cheaply in any city of this country as it is now being done by private enterprise? There is another thing which I have not seen suggested, and yet which is undeniably true, and that is the putting of gas work, under municipal control would practically mean the stifling of inventions. Necessity is the mother of invention. Gas companies have to make gas cheaper, and they therefore call upon their engineers to devise the methods of doing it. The brains of the gas engineers of the world are continually at work trying to see how they can make gas cheaper. As I have said before, engineers in charge of municipal gas works in different parts of the world have done credit to themselves and their profession, and I think at once of Foulis, Hunt, Valon, Woodall and others; but the number of those from whom useful inventions

have come among the gas profession could be counted on the fingers of both hands. Practically all the steps forward that have been made in our business in the last ten years have been the results of private enterprise. Of course, in this country nearly all the gas business is in the control of private corporations; but the public corporations with which we are familiar are certainly the last to which we would turn for any assistance in that direction. In England and in Germany, especially in England and in Scotland, the best brains of our profession are in the employ, not of the municipal companies, but of the private corporations; because private corporations are willing, as a rule, to pay prices which city governments will not pay. I do not forget Mr. Foulis, of Glasgow, and Mr. Hunt, of Birmingham. I should consider that if the business of gas management went as a whole into the hands of municipal ownership it would be a decided step backward for the profession. The English gas companies which are under the control of private corporations, sell better and cheaper gas as a rule right through the country than the municipal corporations charge for the use of their commodity. I do not think it possible to do this subject justice in a five minutes' talk; and yet, Mr. President, I did not want to decline to respond to your call without saying a few of the things on the subject that come to my mind.

The President—As it is a matter which concerns Connecticut as well as Massachusetts, perhaps Mr. Harbison may have something to say upon the subject.

Mr. Harbison—I have not given this subject much thought. I was quite surprised at a remark made by Dr. Amory in his paper, to the effect that there was a very large public demand for municipal corporations owning lighting stations for the purpose of supplying public lighting. I had not heard that suggestion made in Connecticut. If he has reference to Massachusetts as the New England in which it is becoming general, that may be the fact—I am not so well posted as to Massachusetts; but I do not think that it applies to that large and prominent part of New England which is comprised within the border lines of the State of Connecticut. For myself, I have no faith in the municipal management of lighting stations. Municipalities may be very competent to take care of the street department, and can perhaps manage the water department, but I am not of the opinion that municipal corporations are eminently qualified for giving their fellow citizens light of almost any kind.

Dr. Amory—I would call attention to the fact that there are some cases of the municipal ownership of electric light plants in Maine—as at Lewiston, Bangor, and in some other cities—and if there is any gentleman here from that State, he might give us some information as to how the plan works there.

Mr. Harbison—I want to say a word further as to Dr. Amory's suggestion. His statement may apply to the electric light business, for of course almost any sort of people can go into the electric lighting business; but it requires men of intelligence and of training to properly manage a gas plant.

The President—Is there any one present from Maine or from Massachusetts who has felt the approach of a desire on the part of the public to control his own gas works?

Dr. Amory—I would like the privilege of giving some facts as to Chicago—

Mr. Stiness—And also as to Dunkirk.

Dr. Amory—I had hoped to have a letter to show to the Association to-day which gave the facts as to Dunkirk, and possibly I may get it by to-morrow. I have had no time to go there. I simply want to give from personal observation of two of the stations in Chicago a very low estimate of the cost of the investment. On a lot of land owned by the city of Chicago, on the corner of Chicago avenue and Seventh street, the city built a very substantial and useful building. The lot of land, as nearly as I could get at it from seeing it and from asking questions about it, is 70 feet wide by 100 feet deep; in other words, three city lots. I assume the value of that land to be $6,000, which I presume is a very low price, but I do not know anything about the value of lots in that part of the city. The building and the chimney stack (which was a pretty substantial affair, and must have cost $5,000 or $6,000 to build) I valued at $45,000. I think that is a very low valuation, and perhaps only 50 per cent. of what it ought to be. The three boilers with automatic stokers are very well set, and are in good order. The Westinghouse, Church, Kerr & Co., new boilers, are put at $6,000. There are four 125-horse power engines, which I put at $2,000 apiece, or $8,000. Thirty miles of underground wire at $8,000 per mile, or $240,000. The conduit, which has six ducts, I was informed cost $17.50 per linear foot. The cable cost 12 cents, and the hauling of that cable cost 4 cents; giving $1.64 as the cost per linear foot for each duct. That would make $8,000 per mile, and for 30 miles the investment would stand at $240,000. Then, 250 dynamos and lamps, at $60, would cost $18,000. Steam fittings and miscellaneous investments, $27,000. So that the whole plant of 250 lights might have cost $350,000, according to my estimate; and I should think that you might safely add 25 or 50 per cent. to that. I have assumed the annual depreciation to be 10 per cent.; that would be $35,000 per year, or for each of the 250 lamps $150 per year. Each circuit is 3 miles long, and there are 10 circuits in all. There are 250 lamp posts, costing $20 each; and 10 per cent. depreciation of the lamp posts would add $500 more to the expense. Now, if the pay roll be assumed, from the experience at other stations, to be $12,000 a year, the carbons $3,600, the fuel $10,000, the oil, waste, water, etc, $4,400, it would make the expense of maintaining that station $30,000, or $120 per lamp per year. This added to the $152 would make $272 per year for each lamp. If we double the capacity of that station (and the station is large enough for 500 or 1,000 lamps), we should of course have to reduce for each lamp maintenance a sufficient proportion. The depreciation of course would not be so large, and the additional expenses would not be proportionally so much. The average expense for 300 lamps is assumed to be about $160 per lamp per year, which is not 19½ cents per lamp. That station is not in operation. There is a station in operation where they have a very small space, and every spot of that space is occupied by something or other. They took an old fire engine house and adapted it to their purpose. Their investment, as I make it, is as follows: They have a Wright slow-speed engine, 275 horse power; shafting and friction without load, 57 horse power; so that they only get less than 220 horse power out of the machine I estimated the cost of that engine and machinery. I put the land, building, machinery, boilers, dynamos, and lamps, and 50 miles of underground conduit, at the same price as before, making the total cost of the investment $510,000. The labor, as given to me by their chief engineer, and by one or two other men in the station, was as follows: Chief engineer, $1,200; assistant engineer, $1,080; four stokers, $2,880; six trimmers, $3,240; line tester, $720; three linemen, $2,520; add to this for carbons, $3,800; fuel, $12,000; depreciation, $51,000; making the total expense for that station per year $78,640. That was for from 278 to 302 arc lamps, which was all that they furnished from that station. So that if my estimate is correct, the cost might be 75 cents per lamp per night. At Pittsburgh I went over the East End Electric Light Station, and although I have not transposed all my figures, I have them here in a notebook, and they may be interesting to those who wish the facts. The East End Electric Light Station has been established for three years. Until a year ago they had only 3,000 incandescent lights, and a very few commercial arc lights. This last year they are maintaining 400 arc lights and the 3,000 incandescent lamps have increased in one year to 14,000; and they compete with kerosene oil to a very limited extent, and with natural gas at 10 cents per 1,000. and with manufactured gas at $1 per 1,000. So that Mr. Harbison need not feel quite so sure that gas is the only thing that is going to furnish light.

Mr. Harbison—He is not. The sun gives considerable light down our way.

Dr. Amory—We have got to use the sun, too. Their coal slag in Pittsburgh costs 4½ cents per bushel. For natural gas they pay 3 mills per horse power per hour. That Company never paid a dividend. They have invested $300,000 in stock and $150,000 in bonds, which is the extent of their power to contract debt. They still have orders for 100 arc lights which they cannot fill, and for 1,000 incandescent lights which they cannot fill. They have 270 miles of wire, and no underground circuit. They do their own wiring. They have this force: One engineer, who is a machinist and does the repairing, to whom they pay $100 per month; three engineers, one of whom they pay $3 per day, and the others $2.50; two stokers, at $1.75; two oil boys, who handle the distribution of the natural gas under the boilers, 75 cents per day. They have an 1,800-horse power engine capacity (a Westinghouse engine), and 1,360 boiler capacity at 80 pounds pressure. They have 15 linemen at $2.75 per day; 7 ground men at $1.75 per day; 1 foreman, at $75 per month. They run an incandescent light circuit eight miles from their station.

Mr. Lamson—Are they making any money?

Dr. Amory—You will remember that the first year they only had 3,000 incandescent lights. They cannot possibly have made money except during the last year.

Mr. Lamson—When they are doing all they can hope to do, will they be able to make any money, or are they doing it for the fun of the thing?

Dr. Amory—They are doing as gas companies have often done—they are organizing their concern into a paying basis. I think their financial arrangements are well managed. They have bought real estate;

they have put up 270 miles of circuit; and, of course, they are under-capitalized.

Mr. Lamson—On such figures as you have given they cannot do business and make a profit.

Mr. Stedman—Allow me to suggest to Mr. Lamson that the primary object is not to make a profit on the sale of the light, but by that demonstration to sell a good deal more electrical apparatus.

Mr. Lamson—I want to know where the fun comes in.

Dr. Amory—I want to correct Colonel Stedman on that point. This Company is not to my knowledge owned by the Westinghouse people.

Mr. Stedman—They use Westinghouse machinery.

Dr. Amory—But I do not think it is under the Westinghouse people. I judge from what I heard the Westinghouse people are not in control of the stock. I will add that they charge six-tenths of one cent per hour for each 16 candle light, which is measured by meter; and they charge 25 cents per month for the use of that meter. I am only giving you the facts. Of course, I know nothing about their affairs. I want you to realize that a year ago they would only sell 3,000 incandescent lamps, and, of course, they could make no money. The past year they have sold 14,000 incandescent lamps and 400 arc lamps; for each of the latter they have received $100 per year. They use natural gas for fuel, which costs 3 mills per horse power per hour, as against 8 or 9 mills here. I cannot give you any further information than that. It is only three years since they first began to do business. I can give you an estimate of their valuation: 3,450 poles, 50 to 60 feet in height, at $10 per pole, will be $34,500; 270 miles of wire, at $160 per mile, would be about the same; 400 arc lamps and dynamos, at $60 per lamp, would be $24,000; one 1,800-horse power engine, reckoned at $15 per horse power, would be $27,000; their boiler, 1,400-horse power, at $10, would be $14,000; their land and buildings, etc., $125,000. They have a whole block. They own this land. Their contingencies would make their total investment cost, as I valued it, $300,000. They have an alternating plant of 15,000 lights, which, at $8 or $9 a lamp capacity, would make $420,000, and their whole investment would, therefore, be about $450,000. I do not see but that that comes out pretty fairly. I presume that next year they will make some money. I do not see why they should not.

The President—The discussion has drifted somewhat away from the original subject. While we recognize the necessity of becoming acquainted with these details, I think we had better pass over this discussion, as we have so many other papers before us for consideration.

Mr. Harbison—I think the Association is under obligations to Dr. Amory (I am sure I am) for the time that he has taken to gather these statistics and to prepare this paper, which is interesting, to say the least. I move the thanks of the Association be tendered him for his kindness in the matter. [Adopted.]

(To be continued.)

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Feb. 10, 1890.

The Gas Stokers Strike in South London—The Gas Light and Coke Company Gas Testing in London—Gadd and Mason's Gasholder Construction.

The strike of stokers in South London has been brought to a close, and in a manner that is simply farcical. The various labor Unions, concerned have come to an agreement (?) with the Directors of the South Metropolitan Gas Company on two conditions. These are that the Company shall revert to the eight hour system as in operation before the strike, and that preference shall be given to former workmen in the case of any vacancies arising. This is the sum and substance of all that is gained by the recent strike. This is the total benefit that the "Union" is able to secure for its members. Yet the officers of the various Unions undertake, upon the acceptance of them, to declare the strike at an end. The farcical nature of the whole thing will be evident, when we remember that neither of these conditions touches upon the points in dispute. The company had previously adopted the eight hour shift and got it fairly into working order. Throughout the dispute there has not been the slightest hint of any fears on the part of the men, as to its rejection. So far from making things hot for their old workmen, the Company were doing their best to satisfy them, and would not, but for the action of the men themselves, take a single new hand, to the detriment of an old one against whom no fault could be laid. The only advantage, then, that the Union has secured for the men, is the stipulation that they shall have the preference when any vacancies arise, a stipulation which is of very little value at this time of the year. Mr. Livesey has already explained that he has worked the two-shift system during the emergency, but is willing to return to the three shifts as soon as he can get into regular working. But then there are the new men. It was of course necessary to offer every inducement in the shape of promise of regular employment, in order to secure a sufficient number of new men when the old ones left. And these new men have now the first claim, so that the Directors could not honorably turn them off in order to take on old hands. The conclusion, therefore, appears unavoidable, that at the best there are not likely to be vacancies for more than one-third of the strikers, and that even this cannot occur until next winter. And then, that many will only be able to secure temporary work as "winter hands." It also appears that the official agreement (?) has been forestalled by a private understanding between Mr. Livesey and several of the men who have sent in their names as willing to return. Mr. Livesey states that a list of these has been kept, and that all vacancies that arise are supplied from it. This is the end of the great strike. The Stokers' Union, in order to preserve itself a habitation and a name, is obliged to go through the form and agreement that secures nothing for its members. It not only leaves them in the same position as they were before, but lamenting the loss of good situations, thrown up at the bidding of the Union, and lost without the receiving of a single benefit in return.

It only seems a few days ago that the officers of the "Union" were talking, not only of stopping the gas supply in London, but also the coal, to say nothing of other inconveniences that were to be inflicted on the British public, as a means to the securing of their ends. Indeed, one almost fancied that the old inquisition was to come again in another form, and that the public were to be worried and tortured to an unlimited extent, in order to force them to obey the behests of the Union, or to use their influence in furthering its desires. All these bubbles are now pricked and have vanished. Many people will bring forward theories to account for the collapse of the Union, and I would venture to suggest one. That is, because they have done so much unnecessary business on Sundays. No one knows better than gas engineers that certain work must of necessity be done on that day; but when we find a society—let its objects be what it may—making a practice of utilizing Sabbath after Sabbath as regular field days, to the utter disturbance of all associations usually connected with that day of the week, we may safely prophesy that the objects of that society are not likely to prosper. It is a remarkable thing that those gas undertakings which have been foremost in diminishing Sunday labor as far as practicable, are without exception amongst the most prosperous in the country. For a striking example one need not go further than the one just under discussion—the South Metropolitan Gas Company.

At this early period of the year only a few gas undertakings have completed the preparation of their accounts for the last half of 1889. Amongst the first to appear, as usual, are those of the Gas Light and Coke Company; and the information which the Directors bring forward is of a satisfactory character, notwithstanding various little troubles. They are again able to pay full dividends, and have experienced a large increase—more than 5 per cent. as compared with last year—in the sale of gas. This is chiefly ascribed to the extended use of gas stoves for heating and cooking. During the half year they have sold 2,600, and let on hire nearly 5,600 stoves, in addition to those previously disposed of, showing a large and rapid development in the use of gas as fuel. The recent reductions in the price of gas, together with the increased price of coal, are no doubt concerned in this to some extent. With coal at present prices, a high quality heating gas at 60 cents per 1,000 cu. ft. is a comparatively cheap fuel. A considerable extension in the manufacturing, storing and distributing plant will shortly be necessary. The Directors have to contend with increased prices of coal, iron, fireclay and all kinds of materials and stores, besides a very substantial addition of about $750,000 per annum to the wages account. It is a somewhat disappointing commentary on this liberal treatment of their workmen, that the yield of gas per ton of coal has scarcely been so good. In noticing the result of Mr. Trewby's recent visit to the United States, the Directors say that although enriched water gas is not likely to replace coal gas in England, it may be found useful to provide for the manufacture of water gas, to be used in addition to and in conjunction with coal gas on occasions when a large quantity of gas is required to meet a sudden demand. They are about to conduct experiments on the practical scale in this direction, and also in regard to processes for improved carbonization and dealing with residuals. The Dinsmore process and the inclined retort are probably in view here.

I have on several occasions commented on the work of examining the gas supply in London, as carried on under the superintendence of the Gas Referees. Although the operations in this department are of an

extensive character, costing several thousands per annum, it is surprising how seldom they are referred to in public. If a speaker at a meeting wants to refer to the quality of the gas supply, he usually indicates it by adjectives of his own choosing, just as he might do if it was never officially tested at all. In the public press also, it scarcely ever happens that the quality of the gas is indicated by a reference to the weekly returns of the Superintendent Examiner. The whole is, therefore, only a costly way of playing watch dog upon the gas companies. The Referees also, do not appear fortunate in their relations with the suppliers, or with their own staff. They have offended the former by introducing alteration in the apparatus, which are said to have the effect of considerably deteriorating the apparent value of the gas, and at the same time to be beyond the limits coutemplated by the Parliamentary regulations. The amended instructions to the Examiners have had a somewhat similar effect, in that these gentlemen are called upon to devote a much larger space of their lives and attention to their duties, while at the same time nothing has been said about an increased salary. Having really doubled the work, the Referees should have recommended a proportionate increase of remuneration in the proper quarter. The result is that the staff has combined together and forwarded a spirited memorial to the County Council, asking for the adoption of a standard more accurate than the sperm candle at present used, and also for an adequate increase of salary. The fact that, according to the showing of their own superintendent, the results recorded by the Examiners are not of a reliable character, on account of the deficiencies of the sperm candle, in no way detracts from the labor of obtaining those results, and these gentlemen are quite in order in asking for a proper recognition of their skill, patience, and time, that are indispensible to the efficient carrying out of the very elaborate instructions issued by the Gas Referees.

A gasholder without columns, girders, or other external guide framing, has lately been erected at Northwich. It is provided with Gadd and Masons spiral guides, to which I have referred on a previous occasion. The diameter is 60 ft., and there are two lifts each 20 ft. high. At equal distances round the inside of the tank are fixed the guide rails, eight in number, placed against the tank wall at an angle of 45°. A similar series of guides are fixed on the interior of the outer lift for the guiding of the inner lift. The pulleys are made of steel and are 10 in. diameter, working on 2 in. iron axles. The inner pulleys are faced solid, and run in the trough of the guide, which is H shape in section. But those on the outside are grooved, so as to take the outer edge of the guide.

These particulars are taken from a description of the holder furnished to the *Journal of Gas Lighting* by Mr. Thos. Newbigging, C.E. It is estimated that the actual saving in weight of metal used is 34 tons, and this could be increased in future structures of the same kind, seeing that the present holder is somewhat in the way of a new departure, and has, therefore, been made stronger in several parts of the framework than the experience which it has been the means of affording shows to be necessary. The saving in cost of ironwork is put at about $3,000. The tank is also cheaper, as there is no excavating for piers, no brickwork for same, and no base stones for the columns. The pressure given by the holder when full is 7 inches, of which 4½ inches is furnished by the bottom lift. The holder has been observed whilst under the influence of the strong gales that have recently occurred, and whilst nearly full of gas. It has not shown any movement worth recording. The Northwich holder may, therefore, be taken as a practical demonstration of the truth of the principles first enunciated by Mr. Wm. Gadd. It has been shown to a party of about 100 gas engineers from different parts of the country, who found it fully inflated on their arrival at the works. After thoroughly inspecting it while in this condition and receiving any desired information from Mr. Newbigging and Mr. Gadd, who were present, connection was opened with another holder, and it was allowed to empty itself in the presence of the company. The action of the apparatus was pronounced to be satisfactory in every way.

AT a meeting of the Malden (Mass.) Board of Aldermen one of the things considered was the annual appropriation bill. When it was reached Alderman Russell moved that the sum of $18,000 be substituted for $16,500 on account of street lights, giving as his reason therefor that in case such action were not taken the city could not add to the electric lighting service, and thought that the price charged ($90 per annum for each arc burned 300 nights per year) was not excessive. Ald. Devir objected on the ground that Chelsea paid but $80 per annum for arcs burned every night in the year. The Russell amendment was then rejected.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE ordinance introduced in City Councils of St. Louis, which subsequently received the indorsement of both branches of the government, limiting the price which gas companies might charge for gas to 90 cents per 1,000 foot, has been vetoed by Mayor Noonan. The message announcing this action is reasonable, and so unlike the fulminations of the ordinary city authority when dealing with gas supply, that we reproduce it in full. "I herewith return Council bill No. 44 without my approval. This measure was introduced into the Council on May 10, 1889. It passed that body on July 26, 1889, establishing the price of gas, on and after February 1, 1890, at $1.18¾ per 1,000 cubic feet. At this time the price of gas was, in this city, except in a small territory, $1.50 per 1,000 cubic feet. In the House of Delegates the bill was considered and so amended, as to establish for 5 years the price of illuminating gas at 90 cents per 1,000 cubic feet, and fuel gas at 50 cents per 1,000. In this shape it passed the House of Delegates, on January 7, 1890. The Council concurred in the amendments and adopted the amended bill on February 7, 1890. In the meantime, on January 1, 1890, the gas company reduced the price of gas to $1.18¾ per 1,000 cubic feet, the price originally placed by the Council, at which price it is now sold to consumers. The power to regulate the price of gas, conferred on the city by its charter, is to be exercised in a reasonable manner ; and an ordinance on the subject that is deemed unreasonable by the courts will be held to be invalid and of no force or effect. Taking the price at which the article is sold in the principal cities of this country, which in no case is lower than $1.25 per 1,000, I do not think St Lous is justified in demanding coal gas for illuminating purposes at 90 cents per 1,000 cubic feet. The policy of the local government should be to encourage business pursuits and enterprises by not interfering with or hampering them, save in cases where the necessity of municipal action for the protection of the community is obvious. By abstaining from exercising the power to regulate, except in the cases above indicated, a stability and tone are given to investments of capital in this city, and the prosperity and welfare of the community are correspondingly enhanced and augmented. I have during my administration endeavored to act on the above policy, believing it to be fraught with world-wide benefits to St. Louis, and, in the view I take of the matter before me, I cannot give my approval to Council bill No. 44.—EDWARD A. NOONAN, Mayor."

THE Laclede Gas Company have determined to build eight benches of 7's, on the Coze inclined plan. It is hoped to have the settings in operation next May, during the time of the Western Association meeting ; and as the first foundation stone is still unplaced, it will be readily seen that Engineer Egner and his assistants will have to keep the contractors moving all the time, if the Western Association is to witness the trial run. It also strikes us that the proprietors of the Laclede Company are to be congratulated on their pluck in determining to make such an extensive trial of a system that still requires time to demonstrate thoroughly its merits.

THE Citizen's Gas Light Company, N. Y., will, at a meeting set for the 12th inst., act upon a proposition to increase the capital stock of the Company from 60,000 shares to 75,000 shares, or an increase in money value at par ($20) of $300,000. We understand that the Company will, at the termination of its current contract with the Fulton-Municipal Company, manufacture its own gas on the old works site in South Brooklyn, under the Meeze patents and systems.

THE Directors of the San Jose (Cal.) Light and Power Company have adopted resolutions looking to plant betterment, that will involve an expenditure of $75,000. The holder contract (vessel to have a capacity of 150,000 cubic feet) has been awarded to the Stacy Manufacturing Company. This looks as if gas were holding its own on the Pacific coast district.

THE proprietors of the Corning (N. Y.) Gas Light Company have decided to engage in the supply of electric currents. The Thomson-Houston system has been chosen, and the installation is to be in working order by May 1.

WE understand that the gas and electric light plants at Evansville, Ind., have been purchased by the U. G. I. Company, which will operate the same hereafter.

MR. RICHMOND E. SLADE, of the White Plains (N. Y.) Gas Company, is a bachelor no longer, having been united in marriage, on the evening of

Feb. 12, to Miss Jennie A. Wiggins, daughter of the late H. S. Wiggins, of Yonkers. May their lot be a happy one.

ONE result of the recent astounding bank developments in this city will be in all probability the postponement of the completion of construction work on the plant of the Empire Gas and Electric Light Company, of Huntington, L. I. President Claassen, whose management of the Sixth National Bank brought him plenty of notoriety at least, was at the head of the Huntington enterprise.

MR. D. W. CRAFTS, of Northampton, Mass., was one of the "regulars" who failed to answer his name during roll-call at the New England meeting. Perhaps his non-appearance may be explained in the statement that an explosion occurred at the Northampton works on the night of Feb. 16. The damage to property, however, was slight, and no one was injured.

S. A. BAXTER, whose connection with the National Oil Company, of Lima, Ohio, is well known in the West, has instituted suit against the St. Paul (Minn.) Gas Company for $54,168 in the United States Circuit Court, alleging breach of contract as the basis for the action.

SENATOR POYNTZ, we understand, has secured the adoption by the Kentucky Legislature of the following resolutions, which savor very strongly of a "strike" at the proprietors of the Louisville Gas Company:

"*Whereas*, Through the public prints, and in general comment, statements have been made to the effect that the Louisville Gas Company, a corporation chartered by the General Assembly of Kentucky, is openly, seriously, and flagrantly violating many provisions of its charter; and

"*Whereas*, The said Louisville Gas Company has by such violations forfeited its charter; and

"*Whereas*, It has been commonly rumored that the Louisville Gas Company has not kept faith with the city of Louisville in the quality of light furnished, nor with its patrons in the price charged for fuel and other gas; and

"*Whereas*, It is a matter of public notoriety that the said Gas Company has attempted to interfere with the election of local and State officers by the illegal use of money; therefore be it

"*Resolved* by the General Assembly that a committee of five from the Senate and five from the House be appointed to investigate the affairs of the Louisville Gas Company; to summon witnesses and swear the same; to examine its books, and to be invested with full power to carry out the spirit of these resolutions, and report the result of such investigation to this body."

It is possible that these resolutions were brought about by the malice of the Louisville Electric Light Company, whose proprietors are anxious that the Legislature should refuse to grant the electric light charter which the Gas Company has been endeavoring to secure. It might be well to add that the authorities of Louisville favor the legislation asked for in this respect by the Gas Company.

WE regret to announce the death of Mr. Joseph Alphonse Pagaud, who has acted as Secretary of the Jefferson City (La.) Gas Company since a controlling interest in that enterprise had been secured by the firm of Jackson & Kilpatrick. Mr. Pagaud's death occurred on the morning of Saturday, Feb. 15.

THE Provincial Legislature has refused to indorse the application for an opposition gas charter for Montreal, Canada.

A CORRESPONDENT sends the following: "H. H. Button, one of Milwaukee's oldest and most highly respected citizens, died at his home in Milwaukee on the morning of February 14th. He came to Milwaukee when a youth, and for many years has been a prominent figure in its business and social circles. He was President of the Milwaukee Gas Light Company, and was senior member of the wholesale drug house of Green & Button. He was very well liked.—T. R."

THE proprietors of the Tallahassee (Fla.) Gas and Electric Light Company are greatly elated over the business outlook.

A VERY peculiar suit is that which has been brought before Judge Hawes, Chicago, by one John Larson, who sues the Chicago Gas Light and Coke Company for $5,000, because of injuries received by him in a gas explosion at No. 730 Sedgwick street, May 2, 1888. He claims that the Gas Company neglected to turn the gas off, though the premises had just been vacated by a tenant who had taken away the gas fixtures. The Company's defense was that the explosion was caused by Larson's carelessness in lighting a match.

MR. JACOB NICHOLS, who was largely interested in the fortunes of the Lowell (Mass.) Gas Company, is dead. His demise occurred on the morning of February 16th, was in his 75th year, and was prominently identified with many important local interests.

"THE city of Oshkosh (Wis.) was served with a notice about a fortnight ago by the Oshkosh Gas Company, through its attorneys, Finck & Barber, which in effect is that the Gas Company has wearied of waiting for an answer to the complaint served upon the city some months since, and it will now proceed to take the depositions of scientists or authorities upon the subject of electric lighting in Chicago, Milwaukee and other cities as to the relative merits of the lights furnished by the Gas Company and the Oshkosh Electric Light and Power Company. Suit was commenced by the Gas Company about three months ago against the city and Aldermen of the second ward to show cause why the contract for lighting that ward was not awarded to plaintiff—the lowest bidder; and to compel the defendant to award such contract. The Company claims that by reason of a franchise granted to the Company, of which the Oshkosh Gas Company is the legal successor, it is alone entitled to light the streets of the city. The authorities have simply slighted all the former notices served on them, evidently believing that the Gas Company did not intend to push matters. Now, however, they perceive their mistake. The second ward Aldermen justify their action in letting the contract for lighting in that ward to the Oshkosh Electric Light and Power Company on the ground that the light furnished by the latter Company is far superior to that supplied by the Gas Company. The latter employs the Thomson-Houston system, while the contractors are working under the Brush plan. In my opinion the Gas Company has a good case, and will eventually prove it in the courts to the confusion of the local authorities.—R. E."

IT is more than probable that a gas plant will be erected at Darien, Ga, this spring. This place is the capital of McIntosh county, Ga., and is on the Altamaha river, at a point about 62 miles southwest of Savannah.

THE proprietors of the Electro-Carbon Motive Company, of Chicago—perhaps the concern would be more readily identified under the name of the Baker Gas Engine Company—have decided to put in their manufacturing plant at Aurora, Ills. The Company manufactures gas and gasoline engines and all sorts of electric motors.

"THAT's derned fine," said Farmer Squedunk, as he gazed up at the sign, "Teeth extracted without pain—gas administered." "That's very pooty. I've got the blamedest, ornierest toothache ever was; I read papers, I do, and I know that derned gas trick. Put you to bed and turn on the gas. Next day there is an inquest and a verdict, 'Another fool countryman gone.'"

ARTICLES incorporating the Berkeley Development Company have been filed by Messrs. Geo. W. Kline, Louis Gottshall, W. E. Sell, A. Gunn, and J. L. Scotchler. It is capitalized in $500,000, and one of its objects is "to operate, lease, etc., all systems, plans or plants in producing light and heat by gas, electricity, etc." Berkeley is a post village of Alameda county, Cal., near the Bay of San Francisco, and is about midway of the latter city and Oakland. It ought to be a good place wherein to operate a gas company.

THE Cicero Gas Company—managed by Messrs. Geo. H. Parks, Henry Frink, C. E. Crafts, J. J. Walser, F. L. Ball, H. J. Ullman, S. A. Rothermel and Dr. W. C. Gray—asks for a charter to supply gas for light and fuel in the town of Austin, Ills. The proprietors say they will employ the process in use at Jackson, Mich., and the selling rates are to be $1.50 per 1,000 for illuminating, and 50 cents per 1,000 for heating gas.

THE Lowe type of plant recently installed at Hutchinson, Kas., under the supervision of Mr. Mudie, has answered the tests applied to it satisfactorily.

AT the annual meeting of the Petersburg, Va., Gas Light Company, the following officers were chosen: President, John G. Dunn; Superintendent and Secretary, W. H. Baxter; Treasurer, W. F. Spottiswode; Directors, Alexander Donnan, Dr. H. G. Leigh, John McGill, Nelson

T. Patterson and David Dunlap. The annual reports were indicative of the Company's prosperity.

At the annual meeting of the Augusta (Ga.) Gas Light Company the President—the Hon Geo. T. Barnes—was unavoidably absent because his duties as a Congressman required his presence in Washington. His report for the year, however, was read, and it gave general satisfaction. At the election for officers the following result was reached: President, Hon. Geo. T. Barnes; Secretary, H. B. Adams; Directors, G. T. Barnes, P. Walsh, T. G. Barrett, E. R. Schneider and P. H. Langdon. The stockholders authorized the Directors to subscribe $200 to the exposition, provided the requisite $60,000 was raised.

The Senate Committee on General Laws of the State of Virginia has consented to important amendments to the charter of what is known as the Southside Land and Improvement Company. Under the amendments the Company is empowered to construct and operate gas works at Manchester (opposite Richmond) Va., and we understand that that provision will be taken advantage of at an early date.

The Atlantic City (N. J.) Gas and Water Company has announced a reduction in gas rates to $1.50 per 1,000 cubic feet.

In connection with the buncombe resolutions and action authorizing the investigation of the affairs of the Louisville (Ky.) Gas Company by a special committee of the State Legislature, it will be remembered that one of the assigned reasons for the appointment of the committee is the reported bad quality of the gas that is distributed. Louisville has an official gas inspector—Col. Phil. Bate—who has made careful tests of the gas at least once a week since his appointment to office; and his figures invariably show that the quality of the gas is considerably in excess of the legal requirements as to candle power and purity.

In their estimate of the probable receipts and expenses in the operation of the city gas works at Wheeling, West Va., the Board of Gas Trustees and the Council Committee on Light state that the former are likely to be $98,000, while the latter are put at $114,806. As the cash balance from 1889 was $16,972.28, this would leave a surplus at end of year of $166.28. In the estimate, however, liberal provision is made for "improvements," the sum of $16,101 on this account being made up as follows: Resetting 12 benches of 6's, $4,000; 4 new benches of 6's, $8,000; general repairs, $650; repairs to No. 3 holder, $300; 1 street main governor, $600; 2 sets lime trays, $351; 1 exhauster, engine, etc., $2,200.

The Syracuse (N. Y.) *Courier*, of Feb. 21, contains the following: "The Common Council met at 4 o'clock yesterday afternoon, with Mayor Kirk in the chair. The first thing done was to pass a resolution granting a franchise to the Onondaga Gas Light Company. The resolution was introduced by Ald. Matty. After it was read a motion was made that the resolution be adopted. Ald. Klock amended that the resolution be tabled. The amendment was put to vote and lost, and then the adoption of the resolution was voted on and carried. Alds. Small, Matty, Candee, McAuliffe, Segler and Scanlon voted in favor of it, Alds. Klock and Finnegan voted against it. Ald. Wilken was excused from voting, and Ald. McLennan was absent. The franchise allows the Company to lay pipes through the streets within the limits of the city of Syracuse for illuminating and heating gas. No street or pavement can be torn up without 10 days' notice, and no street paved with asphalt can be torn up by the Company without a permit from the Common Council. While laying its pipes the Company shall make a weekly report of streets and pavements torn up and work done. The Company shall furnish 20-candle power light at a rate of $1.25 per 1,000 cubic feet to the city, and at a rate not to exceed $1.40 per 1,000 cubic feet to the inhabitants. Before the streets are torn up a bond of $35,000 shall be deposited with the City Clerk to protect the city against loss from any action of the Company. The Company must not dispose of or sell its plant except to the city, and must not combine with any other company or persons for the purpose of controlling the price of gas, or of gaining power thereby. Pipes are to be laid through any street whenever the Common Council shall direct." In plain language this is an outrage on the vested rights of the old Syracuse Company, whose proprietors have carried on their business with rare fidelity to the best interests of the local gas consumers. We understand that Mayor Kirk has signed the ordinance, and it is not at all unlikely that the passage of the ordinance may hereafter become the subject of legal inquiry.

[Since the above was put in type, we hastened to place ourselves in communication with a gentleman (a resident of Syracuse), whose knowledge of the facts and factors connected with this brazen deal, being voluminous and accurate, would enable us to give ourselves the precise standing of the position. Thanks to his promptness and courtesy, we can say (and very much to our satisfaction) that the schemers seem to have overreached themselves completely. To employ our correspondents words: "Syracuse, N. Y., Feb. 25th: Our charter election occurred on Tuesday last (18th inst.), when the then Mayor and some of the 'combine' Aldermen were defeated. At a meeting of the old Council—held on Thursday last, they, in a clandestine manner and with closed doors—no one was notified of the meeting, except those who had been *induced* to vote—passed resolutions granting a franchise to the new company. This action brought out an universal protest from our citizens; end everybody condemned the proceedings. The Mayor, who up to this time had been opposed to granting a franchise to the new company, was deceived and cajoled into allowing it to go through, found himself in a hole, from which he tried to raise himself, but failed, as the 'combine' of his Council had gone beyond his control. The newly-elected Mayor and Council were inducted into office last evening, and promptly rescinded the resolutions and annulled the franchises granted on Thursday; the vote was 7 to 3—one member was excused from voting. There are now 7 good, square, honest men in the Council of 11. Hence the old Syracuse Company is still in possession of its own. I cannot tell what may be the outcome, but I do not think the opposition will attempt any legal proceedings, for their local agents have not only 'given them away,' but the old company must have strong points against them, which could no doubt be made with telling force." One other point we would like to make in connection with the passage by the former Council of the opposition ordinance, and that is, the cowardice of the schemers, who met to clinch the "agreement" during Mr. A. C. Woods absence from Syracuse, or when he was attending the meeting of the New England Association. However, all's well that ends well.]

Elsewhere we note a damage suit against the Chicago Gas Light and Coke Company, brought by one Larson for injuries received in a gas explosion. The jury awarded complainant $1,500. The case will be appealed.

At a recent meeting of the Dallas (Texas) City Council an ordinance which sought to name maximum rates for gas and electric lighting was considered. Mr. Kivlen moved to file the bill—this, we understand, is equivalent to the defeat of any measure so disposed of—which, after some opposition, was adopted. Mr. Loeb, in opposing the ordinance, made the following inquiry: "What would my colleague from the Fourth Ward say if I should offer an ordinance compelling him to sell his beer at 2½ cents per glass; or $1.50 per keg?" The member from the Fourth mumbled something about private interests and public corporations, and retired to ruminate.

In an explosion in the purifying house of the Owen Sound (Canada) Gas Company, which occurred on the afternoon of February 22, an employee named Nelson was killed, and the works were damaged in $500.

The Pueblo (Cal.) Gas and Electric Light Company is increasing the capacity of its arc lighting plant.

The Highways Commissioners (Flatbush, L. I.) have refused to renew the contract for public lighting with the local Gas Company, on the ground that the rate submitted—$28 per lamp per annum, which is identical with that of last year—is too high. In the meantime the Company will carry on the lighting, until such time as the matter is adjusted, on the basis of the old rate.

The plant of the Mauch Chunk (Pa.) Gas Company was damaged by an explosion on the afternoon of February 21st.

Articles incorporating the Aspen (Col.) Economic Gas Company have been filed by Messrs. W. C. Pettibone, Geo. W. Hill, A. H. Pettibone, Henry Webber and J. M. McMichael. It is capitalized in $25,000.

Messrs. Stevenson, Kingman, Walsh and others have applied to the St. Louis House Committee of Public Improvements for favorable recognition of a project to supply illuminating and fuel gas in that city. They agree to charge not in excess of 45 cents per 1,000 for heating and 75 cents per 1,000 for illuminating gas, to give the city 10 per cent. of the net receipts, and to file a bond in $100,000 that their pledges shall be carried out.

The Market for Gas Securities.

Consolidated gas shares were inclined to the weak side in the interim of our last report, although values were not materially affected. It is undeniable, however, that there was a marked absence of any elasticity in the trading, which was about all effected at a concession from the rates of a fortnight ago. To-day (Friday) the quotations at noon were 95⅞ to 96. Other city shares, notably Mutual and Standard preferred, were disposed seemingly to go somewhat above prior prices, and this tendency was very marked in respect to Standard preferred, which was bid for freely at 87, while holders insisted on at least 89. The common stock was also in demand, many a nibble at 43 to 46 being recorded. While the preferred may offer a fair chance to investors, we should be chary at advising a purchase of the common. Brooklyn shares are strong, and the thing of moment in that city is the proposed increase in Citizens Company capital, the figures anent which are to be found in our current item columns. It would seem as if the Company had determined to rehabilitate and work its plant, (which as to the district to be supplied is most advantageously situated) on its own account, instead of being willing to figure as a peddler. We congratulate Engineer Byrne on this determination. He has talent, and will now have a chance to make money for his Company.

Chicago Trusts are about as before, and it is generally agreed on that the usual dividend will be declared this afternoon. Laclede common is weaker, at 14½ to 15½, and Baltimore Consolidated has again moved up to the figures of a fortnight ago. The bonds offered by the syndicate now in control of the San Diego (Cal.) works seem to have found favor with investors, the issue having been about all absorbed on the proprietor's terms.

Gas Stocks.

Quotations by Geo. W. Close, Broke and Dealer in Gas Stocks.

16 Wall St., New York City.

March 3.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	95⅞	96
Central	500,000	50	—	—
" Scrip	220,000	—	—	—
Equitable	4,000,000	100	119	122
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	116	118
Mutual	3,500,000	100	110	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co —				
Common Stock	5,000,000	100	45	—
Preferred	5,000,000	100	87	90
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	109	111
Citizens	1,200,000	20	68	70
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	121	124
" Bonds	300,000		100	105
Peoples	1,000,000	10	80	82
" Bonds (5's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	93	96
Nassau	1,000,000	25	115	—
" Ctfs	700,000	1000	120	122
Williamsburgh	1,000,000	50	120	123
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co. —				
1st Series S.F. Trust	7,000,000	1000	93	93½
2d " " "	3,000,000	1000	71	72
Bay State Gas Co.—				
Stock	5,000,000	50	24	25
Income Bonds	2,000,000	1000	—	--
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds.	45,000	—	--	—
Chicago Gas Trust	25,000,000	100	46	46⅛
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	—	93½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	97	—
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	99
2d "	2,500,000	1000	96	100
Consumers Gas Light Co., Jersey City	2,000,000	100	15	25
Bonds	600,000	1000	80	--
Cincinnati G. & C. Co.	6,000,000	100	201	203
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal.			80	90
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	54	54¼
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	102	108
Jersey City	750,000	20	186	190
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	14½	15½
Preferred "	2,500,000	100	—	—
Bonds	9,034,400	1000	84½	—
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds.	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			35	35½
Peoples, Jersey City		—	60	61
" " Bonds.			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	99	100
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co.				
San Francisco, Cal.	10,000,000	100	55½	55¾
Washington, D. C.	2,000,000	20	200	208
Wilmington, Del.		50	88	90

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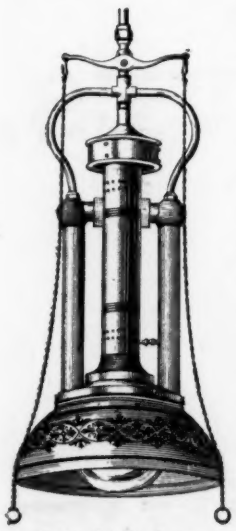

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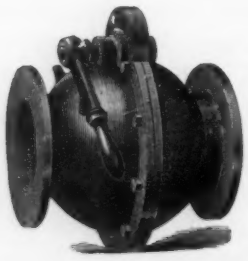

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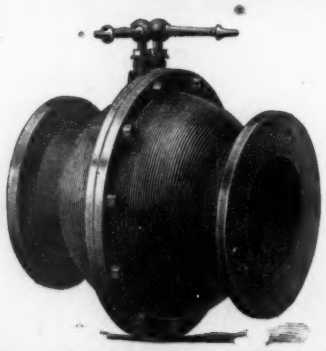

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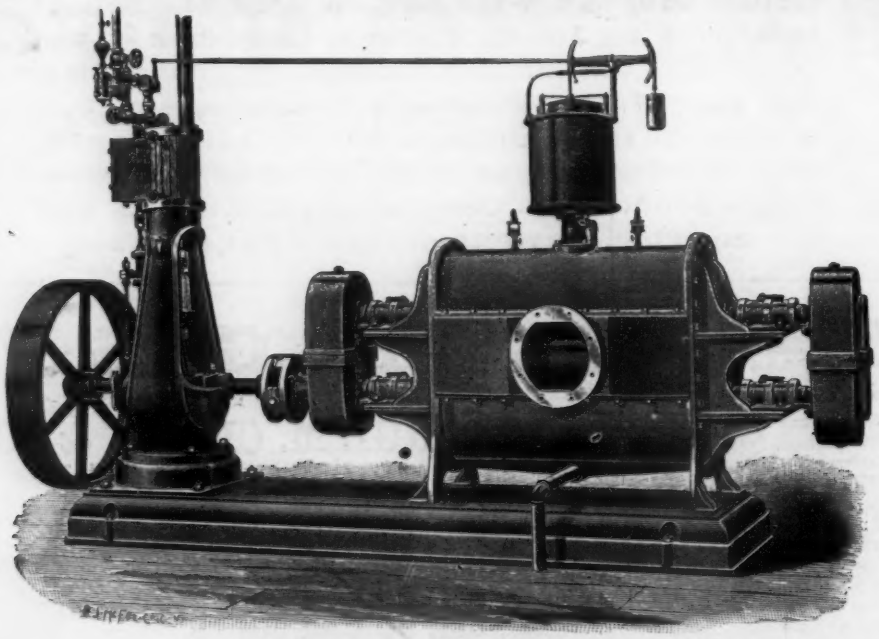

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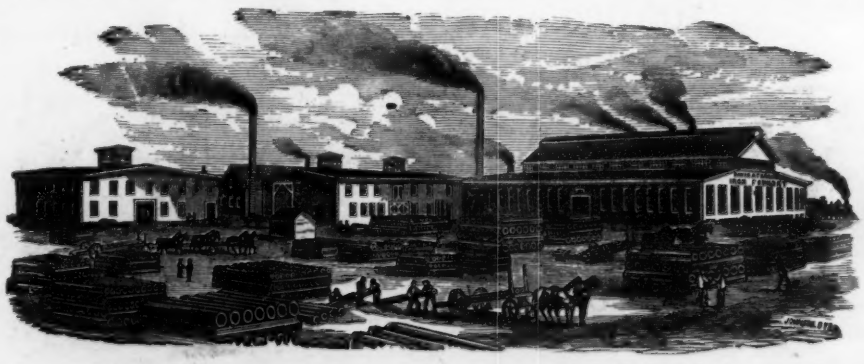

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No. 6,	"	"	1,000,000	"	"	"	8	"	"	" "
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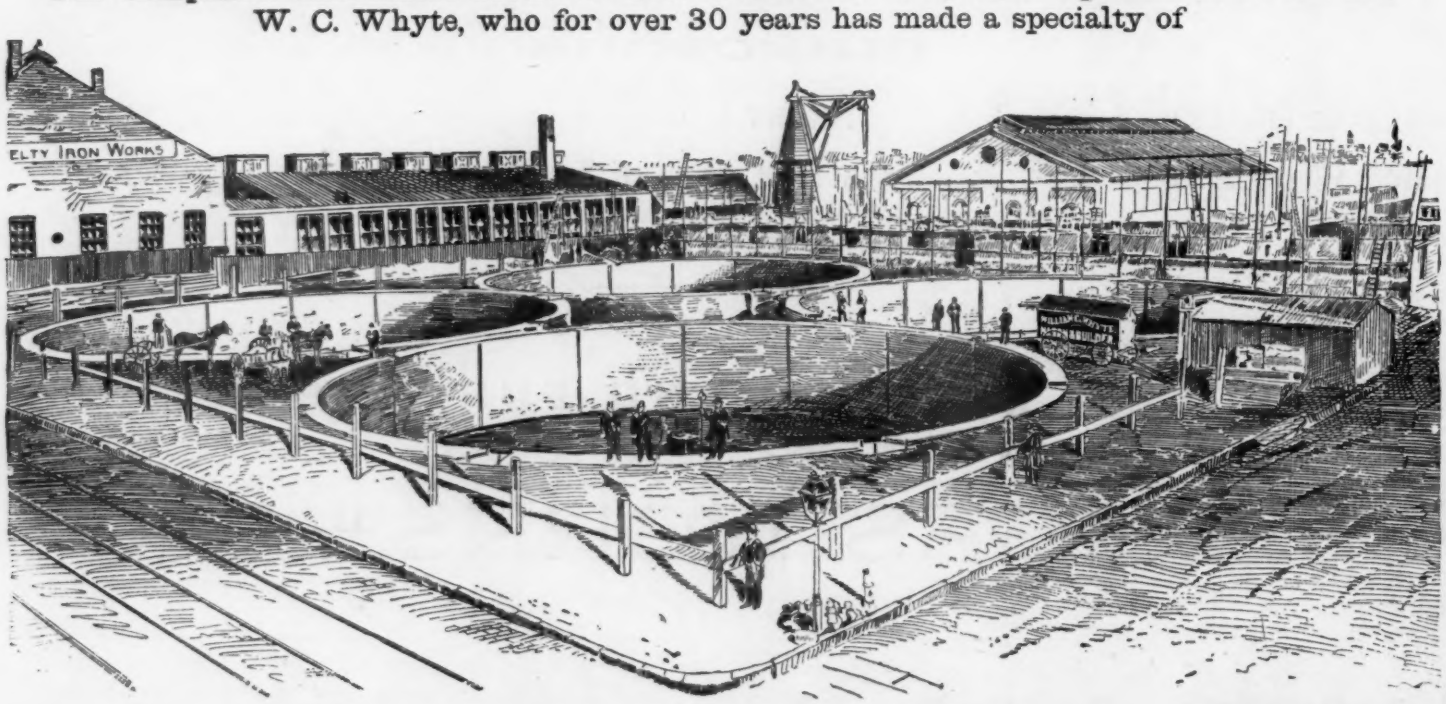

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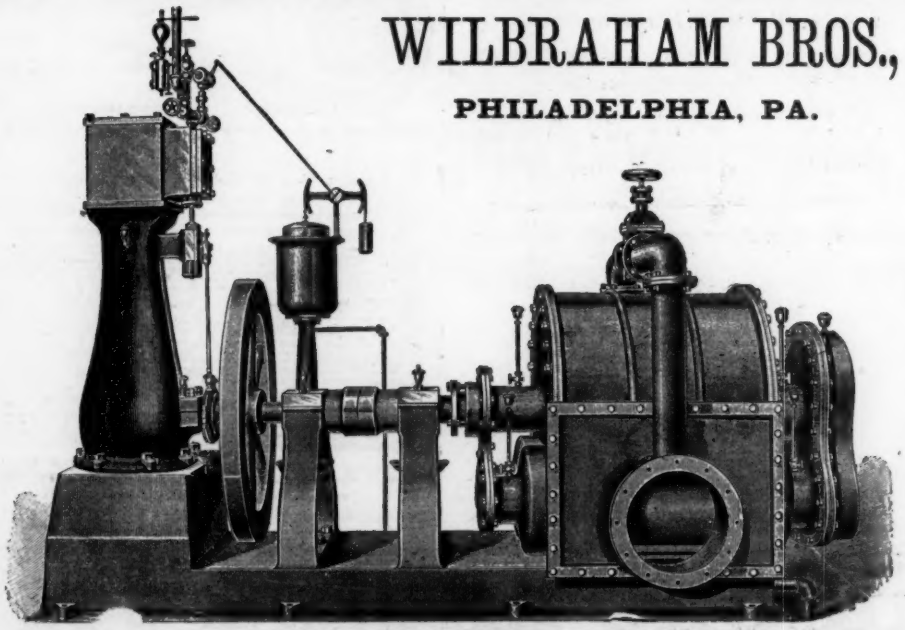

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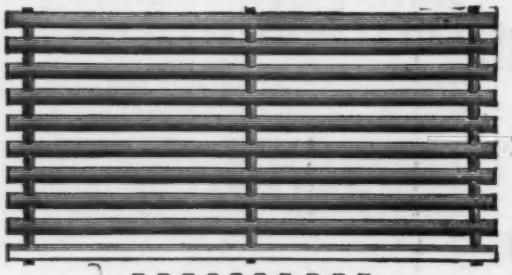

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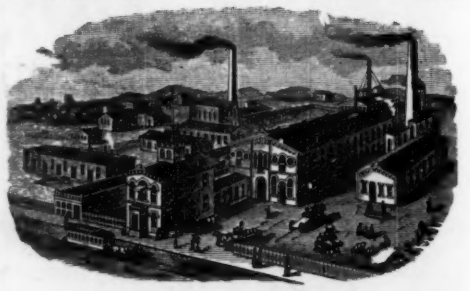

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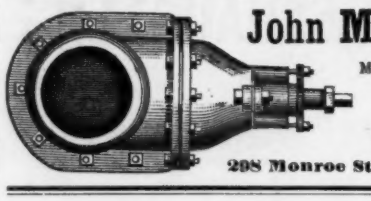

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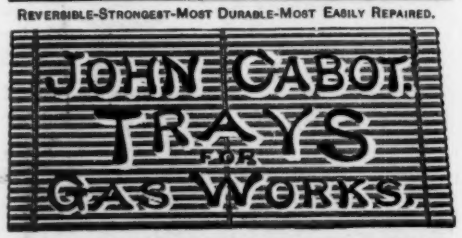

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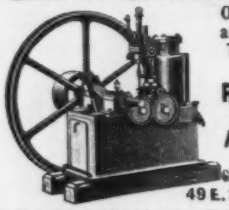

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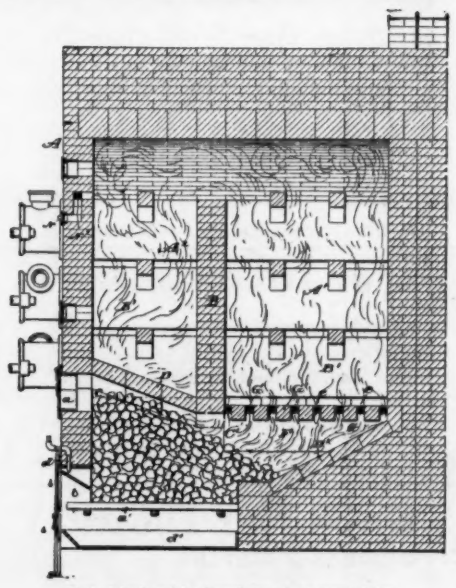

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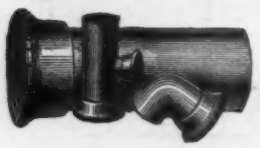

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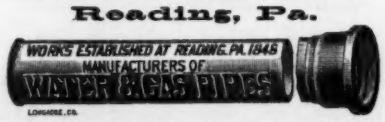

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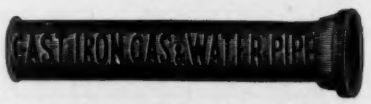

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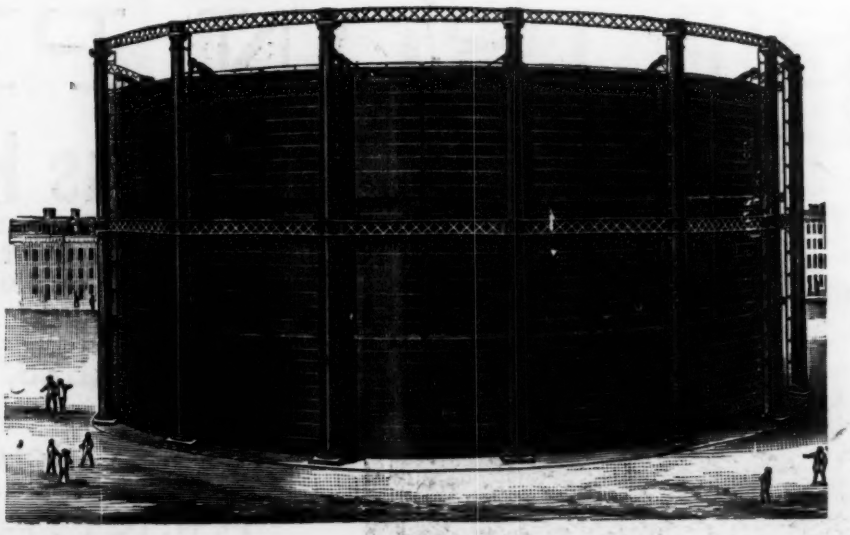

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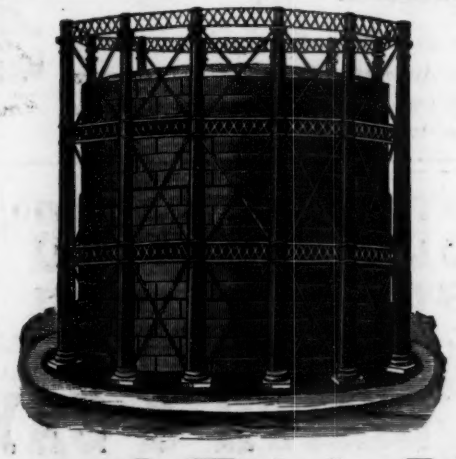

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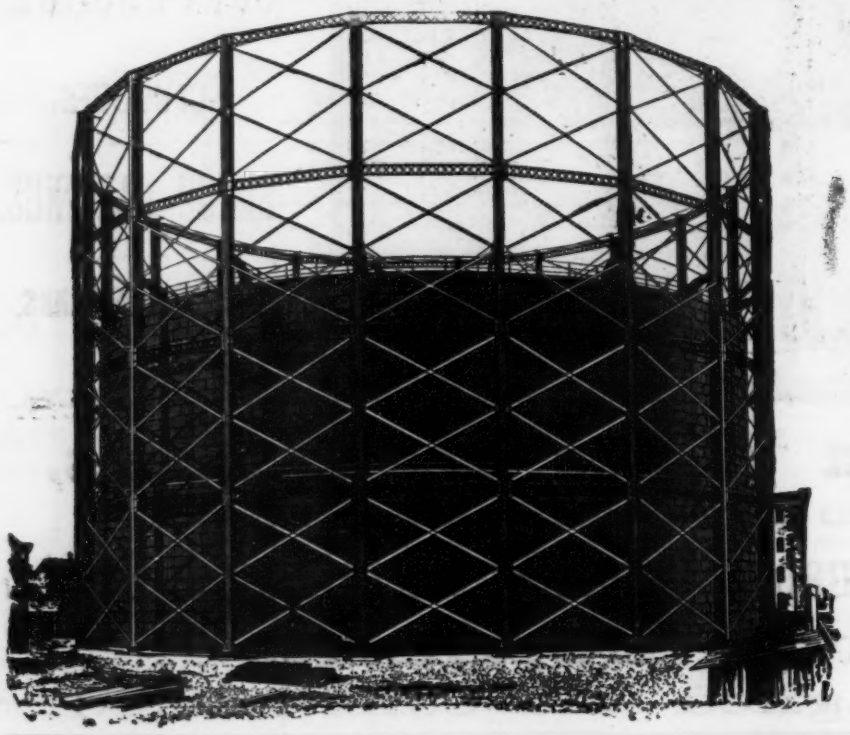

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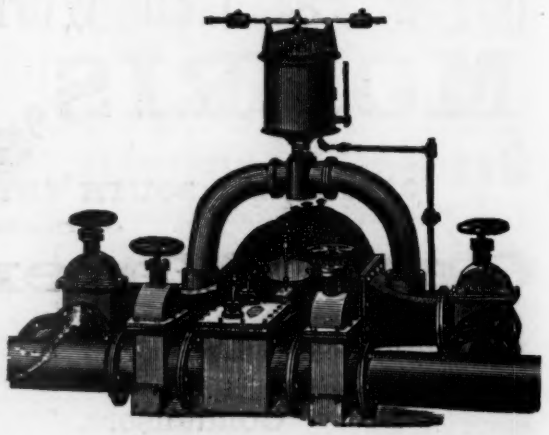

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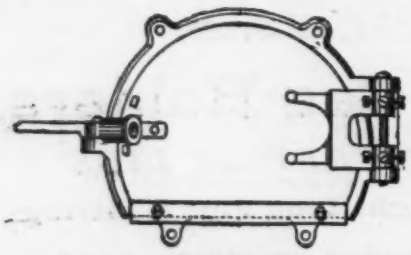

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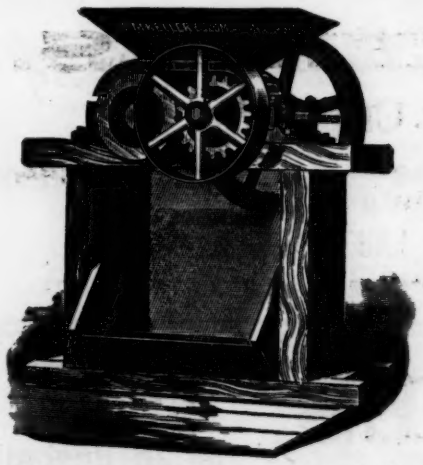

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GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

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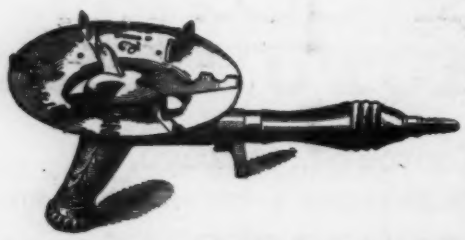

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 8 inches high. Consumption, 6 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¾ in. supply pipe should be used where the pressure is 1 in. or over.